AUTOMOTIVE INDUSTRIES

A CHILTON PUBLICATION

OCTOBER 1, 1959

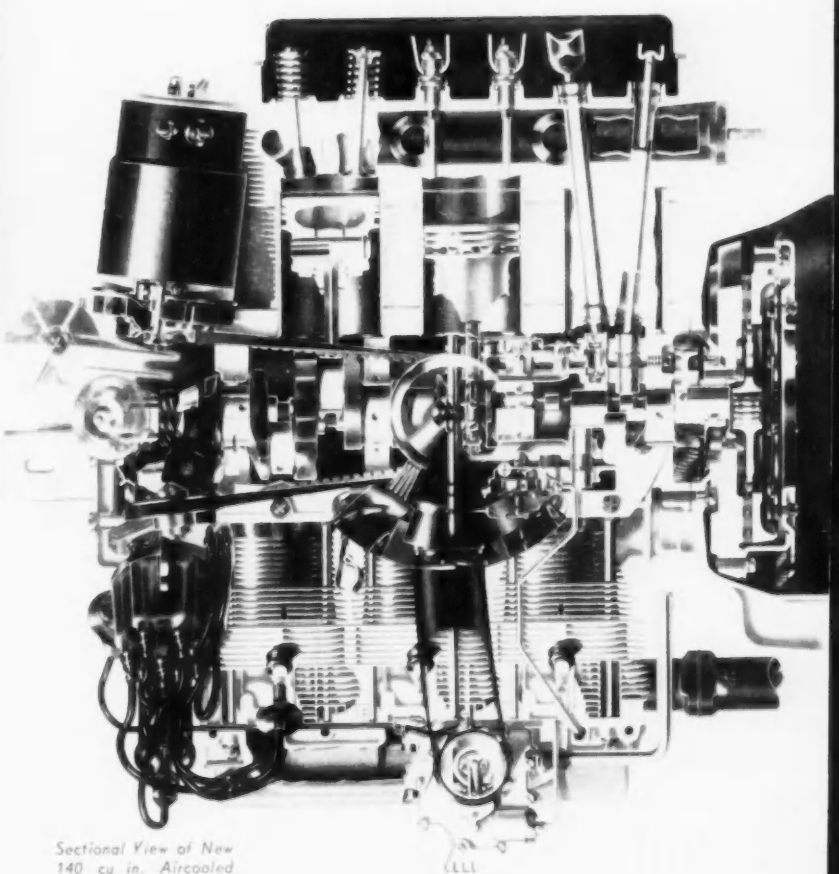
INSIDE the CORVAIR ENGINE

ILLUSTRATED

New Models . . .

Chevrolet Cars and Trucks
Corvair Cars
Ford Cars and Trucks
Dodge Cars and Trucks
Pontiac Cars
Thunderbird
Cadillac Cars
Oldsmobile Cars
Chrysler Imperial
Ford Anglia

Morris and Austin Engines
Caterpillar Power Drives



Sectional View of New 140 cu. in. Aircooled 6-Cylinder Flat Engine

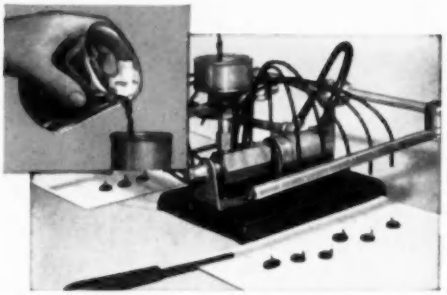
Automotive Engineering

MANAGEMENT · DESIGN · PRODUCTION

Bertsch & Co. finds solution to lubrication problem...with Standard Oil's

RYKON Grease R

Centralized lube system pumps grease through 80 ft. lines in cold temperature; no clogging



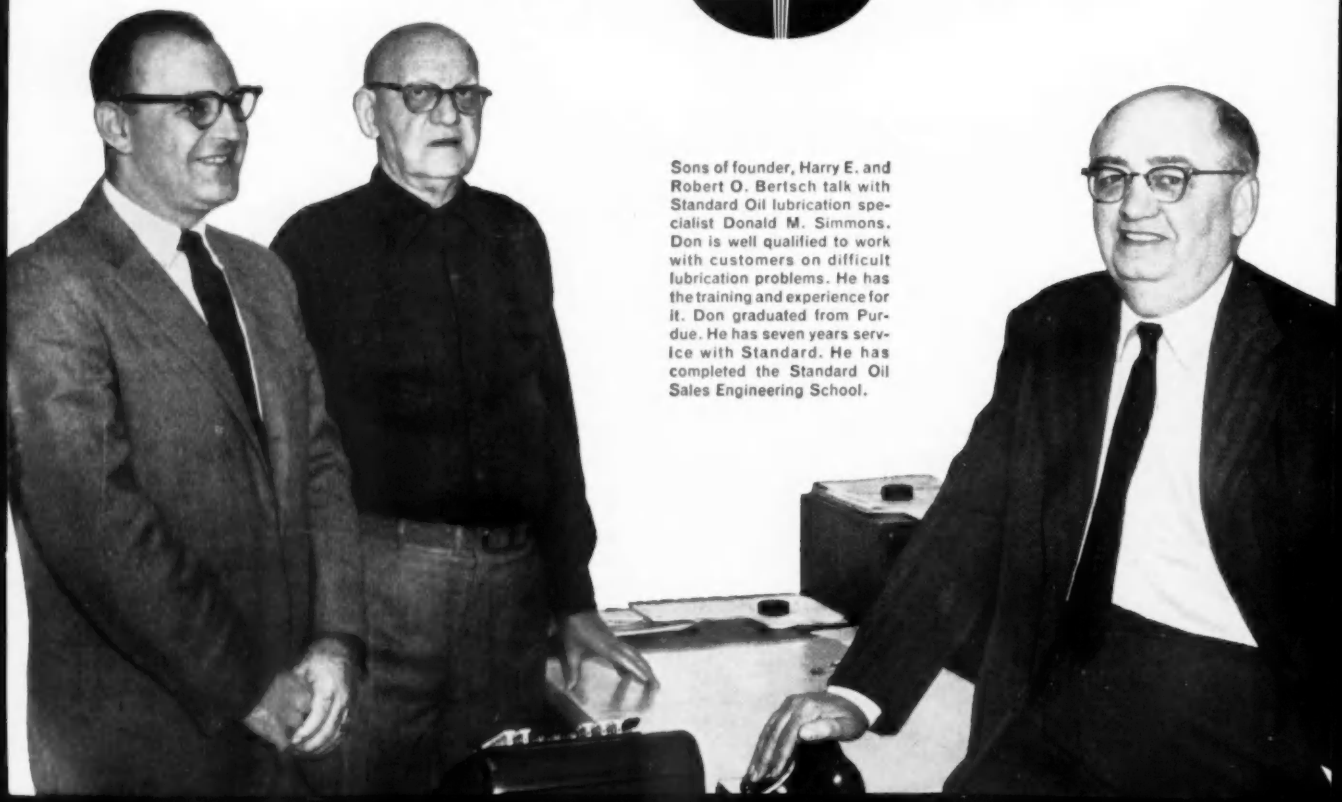
Lab demonstration shows how RYKON Grease R works. Grease is poured into reservoir as a fluid. The shearing action exerted by pump and outlets irreversably converts fluid to a grease. Grease is ejected from outlet lines.

Problem: Bertsch & Company, Cambridge City, Indiana, makes pinch rolls and other metal bending equipment. A centralized lubrication system used on one pinch roll model had to pump grease 80 feet. Greases tried could not be pumped this distance without clogging lines. Since machines are shipped all over the world and are often in operation in cold climates, Bertsch had additional problems. The grease had to be pumpable in cold temperatures. It had to be foolproof so that customers beyond the reach of service calls would experience no problems.

What was done: Bertsch turned to Standard Oil for help. Standard Oil man, D. M. Simmons had the answer: RYKON Grease R. This is a rheopectic grease, one that flows like an oil. Its rheopectic properties cause it, under slight shearing stresses, to turn to a thick, durable grease. RYKON Grease R flows to the pump as a fluid, lubricates the bearings as a grease.

What you can do: Maybe you manufacture equipment that needs a centralized lubrication system and you have been looking for a grease like RYKON R. Get the facts about RYKON Grease R from your nearby Standard Oil lubrication specialist anywhere in the 15 Midwest and Rocky Mountain states. Or write **Standard Oil Company (Indiana), 910 South Michigan Ave., Chicago 80, Illinois.**

You expect more from **STANDARD** *and you get it!*

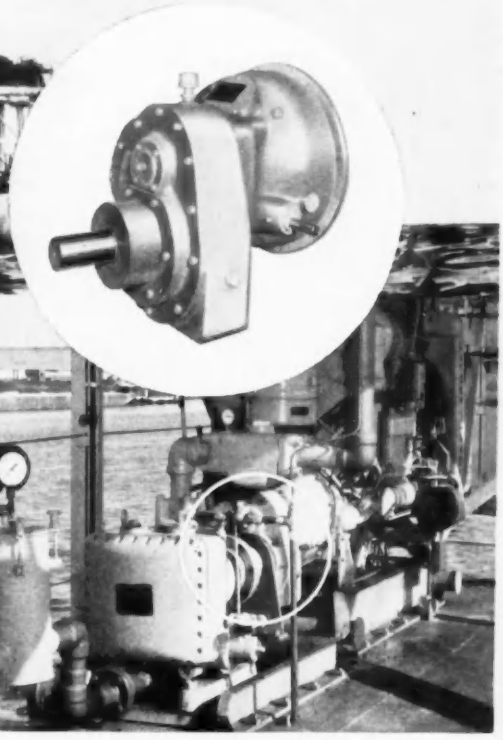


Sons of founder, Harry E. and Robert O. Bertsch talk with Standard Oil lubrication specialist Donald M. Simmons. Don is well qualified to work with customers on difficult lubrication problems. He has the training and experience for it. Don graduated from Purdue. He has seven years service with Standard. He has completed the Standard Oil Sales Engineering School.

Now offshore drilling rigs walk on water

LOADED AND MOVED WITH HYDRAULIC PUMPS, DIESEL-POWERED THROUGH

COTTA HEAVY-DUTY REDUCTION UNITS



Whether your heavy-duty power transmission problem is an ingenious new concept, or just a need for maximum ruggedness and efficiency in the 150 to 2000-lb torque range, you can rely on Cotta for the unit you need.

"Rigmover No. 1," above, picks up an entire Creole Petroleum Company offshore drilling rig, takes it to another drilling site, and properly positions it on the new foundation. The "Rigmover" lifts and positions through hydraulic rams and is propelled by Vickers hydraulic motors. Power is furnished by three Caterpillar D-337 diesel engines, each of which drives a Vickers hydraulic pump through a Cotta SR 12E 930 2:00 to 1 reduction gear. Four 150-hp motors drive screws in both ends of the two pontoons. Lifting capacity is 200 tons. Operated on Lake Maracaibo, Venezuela, the "Rigmover" was designed by Sverdrup and Parcel, Inc., St. Louis, built in New Orleans, by Higgins, Inc.

Select from a wide choice of standard transmissions and gear reducers or specify your unit "engineered-to-order." Heavy-duty Cotta Reduction Units and Transmissions by the thousands serve big pumps, winches, drilling rigs, trucks, rail cars, etc.

THIS INFORMATION WILL HELP YOU

Sent free on request — diagrams, capacity tables, dimensions, and complete specifications. State your problem — COTTA engineers will help you select the right unit for best performance. Write today.

COTTA TRANSMISSION CO., ROCKFORD, ILLINOIS

"An Assurance of Dependable Service"

COTTA

HEAVY-DUTY REDUCTION UNITS

"Engineered-to-order"

← Circle 101 on Inquiry Card for more data

Circle 104 on Inquiry Card for more data

Heavy duty Kenworth "803" end dump truck has high-strength front axle cast in Nickel alloy steel. Loaded weight—70 tons. Made by Kenworth Motor Truck Company, Seattle, Washington.

All brawn...no deadweight... when truck parts are cast nickel steel

Where you need stamina in cast steel parts – without a dead-weight penalty—you'll do well to look into cast Nickel alloy steel.

Kenworth engineers needed off-road toughness and strength in the front axle of their 36-ton capacity ore truck. Needed light weight, too. They chose a cast Nickel alloy steel containing 1% Nickel, 0.6% chromium, 0.5% molybdenum.

Axle is through-hardened for long life, minimum maintenance.

The finished axle, hardened to 200 Brinell, develops a yield strength of 78,000 psi, a tensile strength of 98,000 psi at 21% elongation.

To help you solve specific automotive material selection problems . . . select the most practical materials . . . Inco Development and Research offers a valuable fund of information on Nickel alloy steels. Just write Inco, telling us about your metal problem.

*Registered trademark

THE INTERNATIONAL NICKEL COMPANY, INC.

67 Wall Street New York 5, N. Y.

INCO NICKEL

NICKEL MAKES ALLOYS PERFORM BETTER LONGER

Circle 105 on Inquiry Card for more data

AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE · PUBLISHED SEMI-MONTHLY

OCTOBER 1, 1959 VOL. 121 No. 7

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NBP National Business Publications, Inc.

SBME Society of Business Magazine Editors

ABC Audit Bureau of Circulations

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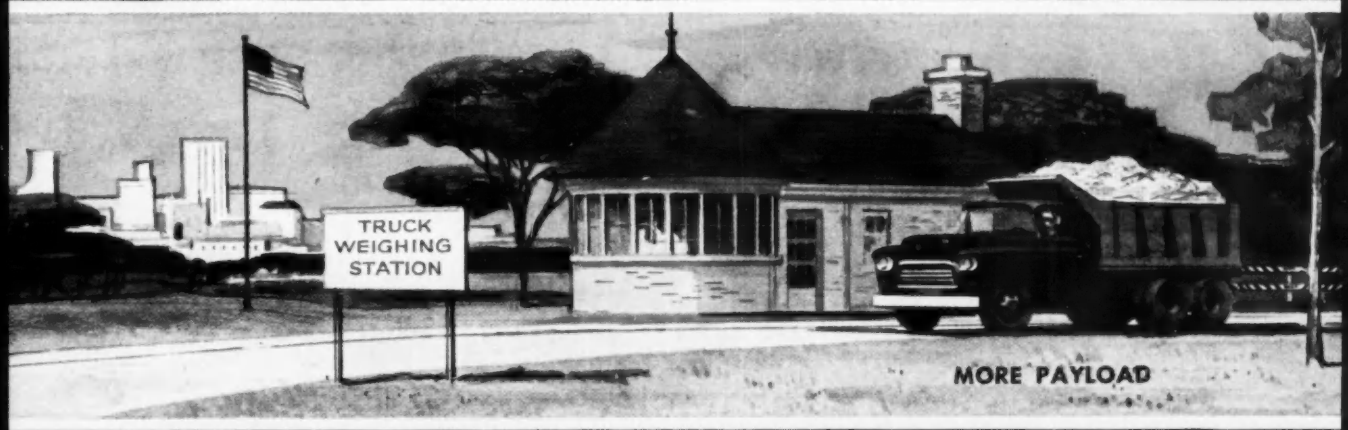
REASONS WHY VACUUM POWER BRAKING IS FIRST CHOICE ON TRUCKS



WITH BENDIX HYDROVAC* LEADING ALL OTHER MAKES COMBINED

When it comes to power braking, the overwhelming choice on trucks is vacuum power, with Hydrovac leading all other makes combined.

You can bet your bottom dollar that such overwhelming preference is based on solid reasons. For example:

By saving dead weight, vacuum power can add several hundred pounds to *payload*, and earn extra dollars, as ton-miles build up.

In addition, there is the vital *safety stand-by* of instantly available physical braking, instead of "no power, no brakes!"

Then, with vacuum power there is less first cost and less expense for maintenance, and it is completely free of compressor drain on engine power.

Any way you look at it, it will pay you to make Hydrovac Vacuum Power Brakes your choice for the best in power braking . . . for the most in value.

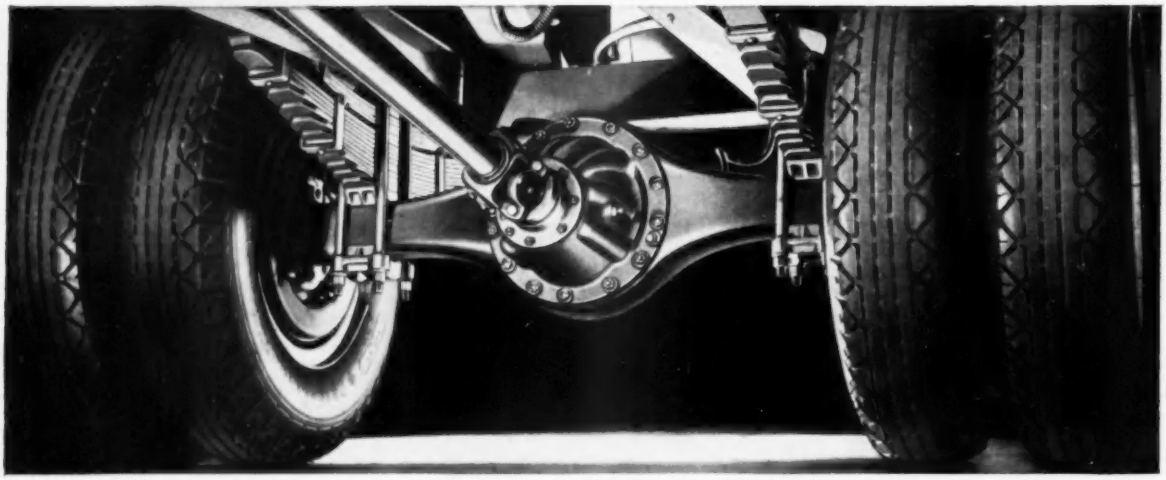
*REG. U.S. PAT. OFF.

Bendix PRODUCTS DIVISION South Bend, IND.

Bendix AVIATION CORPORATION

Circle 106 on Inquiry Card for more data

The superiority of a Timken-Detroit® Axle depends on the quality of all its parts...



Only genuine Timken-Detroit® Replacement Parts

can keep it as good as new!

You bought the best—replace with the best! Every genuine Timken-Detroit Axle replacement part is built to the same high quality standards as original Timken-Detroit parts. By using only genuine Timken-Detroit replacements, you can be sure of retaining the high quality and performance advantages you bought when your axle was new.

Because they are manufactured to the same rigid engineering specifications as the original equipment and carry the same manufacturer's guarantee, Timken-Detroit replacement parts save you time, money and trouble. Extra machining or fitting operations are eliminated. Labor and adjustment costs are cut to a minimum. Parts take less time to install.

Many Timken-Detroit replacement parts are packaged in convenient kits containing all the related components you need to do a "factory-type" job. These kits assure maximum protection so that every parts package you receive arrives in perfect condition.

See your factory authorized vehicle dealer for all your replacement needs. Only he can supply the parts that will *keep* your Timken-Detroit Axles as good as new.

Products of

ROCKWELL-STANDARD CORPORATION

ROCKWELL R STANDARD®

Transmission and Axle Division, Detroit 32, Michigan

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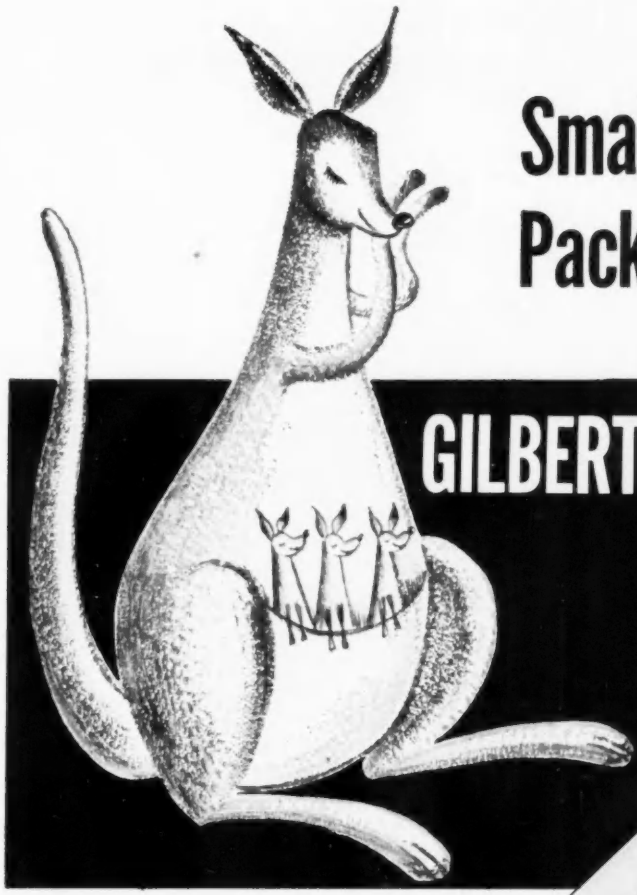
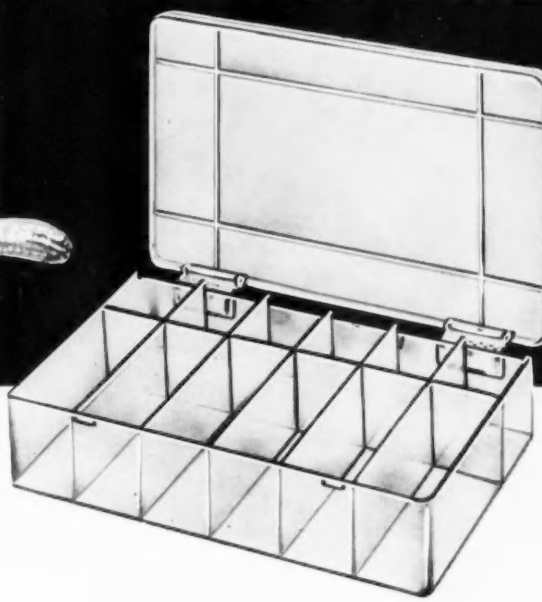
Small Component Packaging Problem?



GILBERT PLASTICS' BOXES



Gilbert Plastics' fine quality rigid boxes are the perfect showcase for small automotive parts and components. They are available from stock in a large variety of compartment designs or to your specifications.

Gilbert Plastics' boxes provide 100% visibility . . . are lightweight and extremely durable . . . and are approved for Military specifications. They facilitate inventory control . . . selection of small parts for assembly . . . helps to sell your product "on sight". . . and reduce shipping costs.

Write Dept. A-1 for samples, catalog and price list.

CONSULT OUR ENGINEERING DEPARTMENT

Our staff of packaging designers is always at your service to help solve all of your plastic packaging problems.

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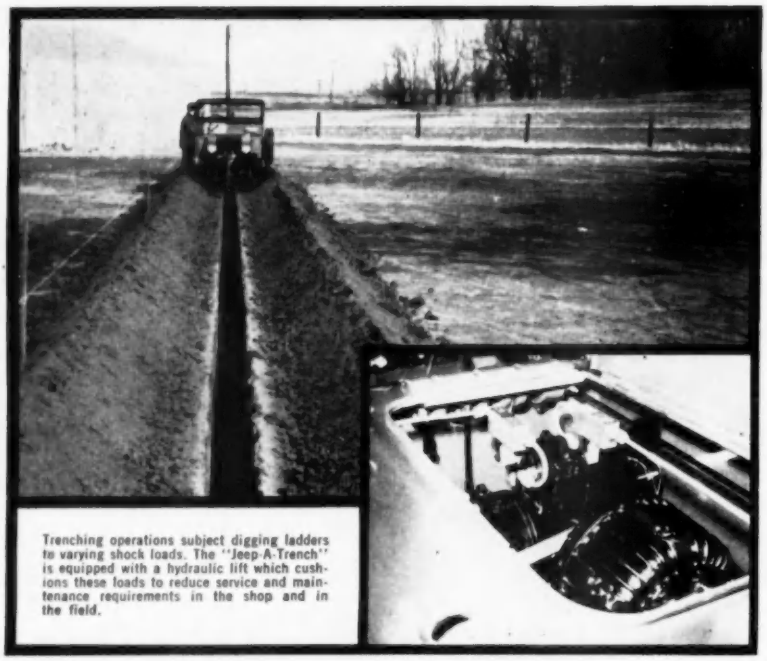
AWARD WINNING IDEAS...

Service Minded Equipment Company Uses Ermeto Fittings on Self-Supporting Hydraulic System for "Jeep-A-Trench"



Trenching operations subject digging ladders to varying shock loads. The "Jeep-A-Trench" is equipped with a hydraulic lift which cushions these loads to reduce service and maintenance requirements in the shop and in the field.

Idea sumbitted by:
Mr. WARREN E. GEORGE
Auburn Machine Works, Inc.
Auburn, Nebraska

In developing the "Jeep-A-Trench", Auburn's engineers considered two important factors: digging in all types of soils subjects any trencher to varying shock loads; and, their equipment must operate in any terrain under all types of conditions. For these reasons, they perfected a hydraulic lift for the digging arm of the "Jeep-A-Trench" that would be as nearly service-free as possible.

"We used steel tubing on our hydraulic system because it withstands greater stresses, does not require the maintenance of rubber covered flexible tubing and it is self-supporting. It is simpler to service," explained Mr. George.

"ERMETO hydraulic fittings were selected because Weatherhead had technical service facilities available all over the U. S. to help service the equipment in case of difficulties."

Auburn is but one of the many service-minded companies relying on Weatherhead fittings for service and reliability. If you desire information or assistance in simplifying your tubing and fittings applications, write today.

ERMETO flareless hydraulic fittings are unmatched for dependability and high pressure control. Available in stainless or carbon steel with "Weathercote" finish. Standard sizes: ⅛ to 2", for pressures up to 10,000 p.s.i.

BRASS & STEEL FITTINGS / HOSE & ASSEMBLIES / TOOLS & ACCESSORIES

WEATHERHEAD

THE WEATHERHEAD CO., FORT WAYNE DIVISION
Dept. AI-10, 128 W. Washington Blvd., Fort Wayne, Ind.
In Canada:
The Weatherhead Co., Ltd., St. Thomas, Ont.

CALENDAR

OF COMING SHOWS AND MEETINGS

SAE National Aeronautic Meeting, Ambassador Hotel, Los Angeles, Calif. ..... Oct. 5-9

Institute of the Aeronautical Sciences, Anglo-American Conference, Hotel Astor, New York, N. Y. ..... Oct. 5-16

Powder Metallurgy Parts Manufacturers Association, annual meeting, Sheraton-Cadillac Hotel, Detroit, Mich. ..... Oct. 6-7

Gray Iron Founders' Society, annual meeting, Fairmont Hotel, San Francisco, Calif. ..... Oct. 7-9

American Vacuum Society, sixth national symposium on vacuum technology, Sheraton Hotel, Philadelphia, Pa. ..... Oct. 7-9

ASTE semi-annual meeting, Chase-Park Plaza Hotels, St. Louis, Mo. ..... Oct. 8-10

National Defense Transportation Association, annual convention and logistics forum, Olympic Hotel, Seattle, Wash. ..... Oct. 11-14

National Electronics Conference, Hotel Sherman, Chicago, Ill. Oct. 12-14

ASTM Pacific Area National Meeting, Sheraton-Palace Hotel, San Francisco, Calif. ..... Oct. 11-16

SPE National Technical Conference, Ambassador Hotel, Los Angeles, Calif. ..... Oct. 13-14

American Production and Inventory Control Society, national technical conference, Hotel New Yorker, New York, N. Y. ..... Oct. 16-17

Magnesium Association, annual convention, Hotel Roosevelt, New York, N. Y. ..... Oct. 19-20

National Safety Congress, Chicago, Ill. ..... Oct. 19-23

ASLE-ASME, Lubrication Conference, Sheraton-McAlpin Hotel, New York, N. Y. ..... Oct. 20-22

National Conference on Standards, Sheraton-Cadillac Hotel, Detroit, Mich. ..... Oct. 20-22

Society for Experimental Stress Analysis, Pick Fort Shelby Hotel, Detroit, Mich. ..... Oct. 21-23

International Motor Show, London, England ..... Oct. 21-31

National Conference on Industrial Hydraulics, Hotel Sherman, Chicago, Ill. ..... Oct. 22-23

AGMA Semi-Annual Meeting, Edgewater Beach Hotel, Chicago, Ill. ..... Oct. 26-28

SAE National Joint Transportation, Diesel Engine, and Fuels and Lubricants Meeting, La Salle Hotel, Chicago, Ill. ..... Oct. 26-30

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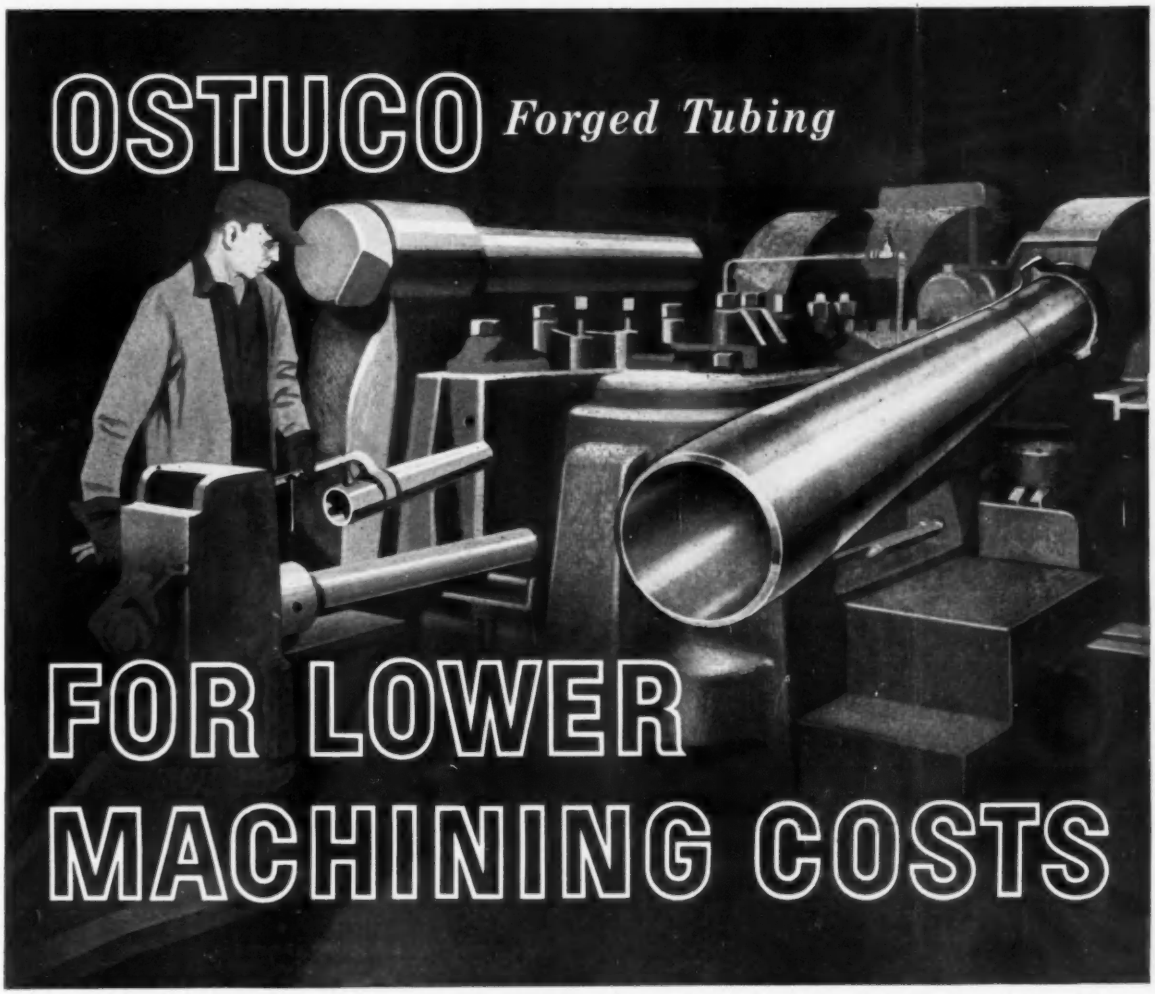
Aircraft Components Manufacturer Specifies

OSTUCO *Forged Tubing*



FOR LOWER MACHINING COSTS

Forging tube end in Shelby mill. In addition, Ohio Seamless can supply tubing flared, swaged, expanded, upset, flanged, shaped, etc.

"Our machining time on this landing gear part in SAE 4140 plummeted from *400 to 180 minutes* when we changed from forgings to Ostuco Forged Tubing.

"In addition to getting *over 80% more parts per workshift*, we like the free-machining qualities of Ostuco tubing that give us extra savings in set-up time and tool grinding costs . . . "

These actual figures, from an eastern manufacturer, indicate the machining economies Ostuco Forged Tubing can effect in your product. The starting point is to call your nearest Ohio Seamless office, listed in the Yellow Pages, or the plant at *Shelby, Ohio — Birthplace of the Seamless Steel Tube Industry in America.*

AA 5850

OSTUCO SHELBY, OHIO — OSTUCO TUBING

OHIO SEAMLESS TUBE DIVISION

of Copperweld Steel Company • SHELBY, OHIO

Seamless and Electric Resistance Welded Steel Tubing • Fabricating and Forging

SALES OFFICES: Birmingham, Charlotte, Chicago (Oak Park), Cleveland, Dayton, Denver, Detroit (Huntington Woods), Houston, Los Angeles (Lynwood), Miami, Moline, New Orleans (Chalmette), New York, North Kansas City, Philadelphia (Wynnewood), Pittsburgh, Rochester, St. Louis, St. Paul, Salt Lake City, Seattle, Tulsa, Wichita **CANADA:** Railway & Power Engr. Corp., Ltd. **EXPORT:** Copperweld Steel International Company, 225 Broadway, New York 7, New York

Circle 112 on Inquiry Card for more data

A new cutting fluid that

with any single-point

Shell's experience in the last 3 years proves that Shell Dromus Oil E can give production increases of at least 25% with comparable cost savings.

Incredible as this may seem, Dromus® Oil E alone accounts for these considerable production increases! And here's how simply Dromus E does it: Use Dromus Oil E (diluted with 20 parts water) at the correct cutting speed. Then, increase the feed rate by one-third and operate as before. You can get a 25% production increase . . . optimum conditions may show as high as 40% improvement!

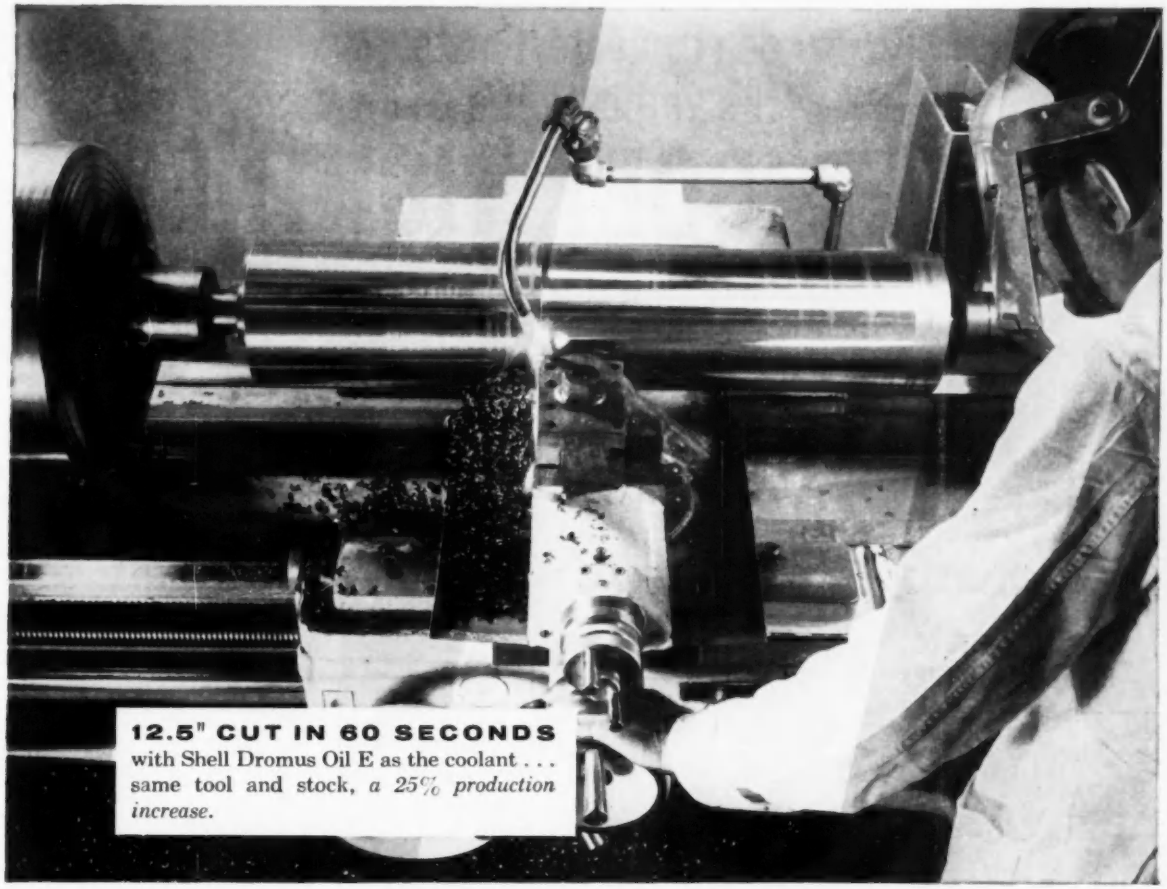
Applies to wet or dry cutting. Regardless of whether you're now cutting dry, or with emulsions or heavy-duty oils, this simple increase of feed applies.

Applies to all milling, turret and automatic lathe set-ups. This is an across-the-board production improvement. If the machine can stand the extra 25% feed, the rule applies to all milling and turning jobs!

Applies to set-ups as they are . . . no changes required. There isn't a single thing that has to be changed or adjusted . . . just the feed and provision for keeping the work wet with Dromus E.

Shell Dromus Oil E offers these many other outstanding benefits too!

1. Greater worker safety—chips are cool.
2. No fire hazard—Dromus E is nonflammable even after water evaporation.
3. Closer dimensional tolerances can be obtained—less heating of the work piece occurs.
4. Brighter surface finish is obtained.
5. Excellent protection against rust.



permits 25% greater feed

(AT FULL SURFACE SPEED)

carbide "throw-away" insert

Dromus Oil E is one of those products that comes up once in a generation. Rather than attempt to offer proof after proof of what this announcement offers, we simply invite you to let the Shell Industrial Products Representative show you what Dromus Oil E can do in *your* plant! Please write Shell Oil Company, 50 West 50th Street, New York 20, New York, or 100 Bush Street, San Francisco 6, California. In Canada: Shell Oil Company of Canada, Limited, 505 University Avenue, Toronto 2, Ontario.

SHELL DROMUS OIL E

THE NEW COOLANT FOR METALWORKING

SHELL

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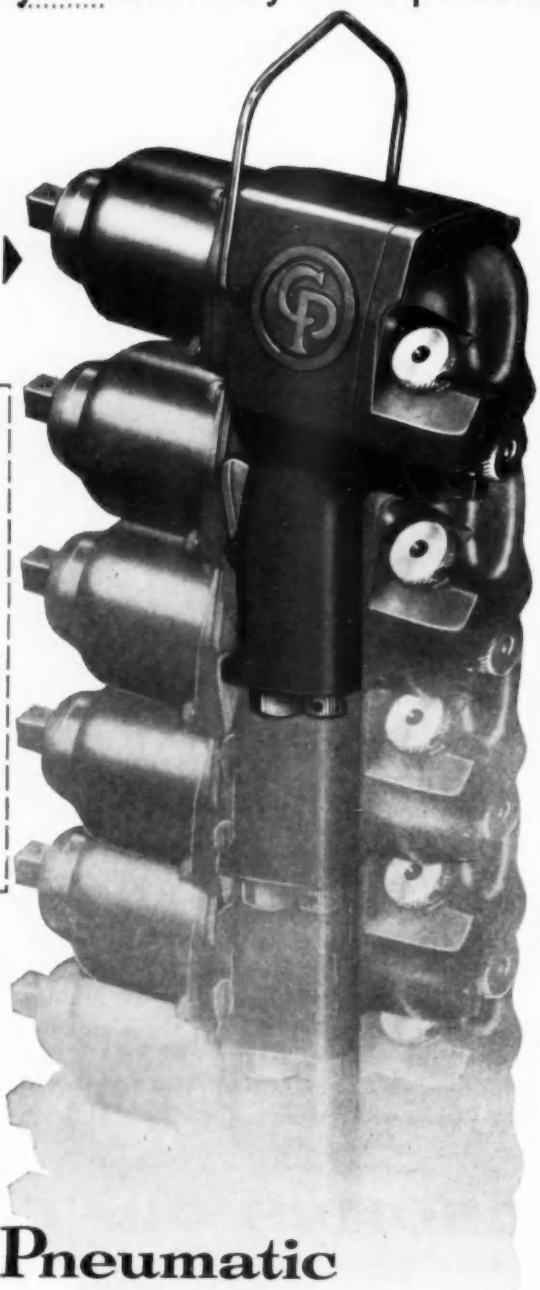
don't underestimate the importance of PROPER BOLT TIGHTNESS in your assembly line operations!



CP-3440-TS adjustable torque range 15 to 80 ft-lbs. ½" square drive.

TORQUE CONTROL IMPACT WRENCHES

CP-3630-RTP adjustable torque range 100 to 350 ft-lbs. ¾" or 1" square drive.

CP-610-RTP adjustable torque range 300 to 600 ft-lbs. 1" square drive.

*A complete line of Torque Control Screwdrivers and Nutrunners solve other threaded fastener torque problems. Available from No. 4 screw size to ⅜" bolt size.

More and more top-flight manufacturers are realizing that *proper bolt tightness* is a quality factor that gives them a sales edge over competitive products . . . their assembly line foremen know that the use of TORQUE CONTROL IMPACT WRENCHES in the driving of nuts and bolts to "correct torque" means:

- Less work spoilage
- No chance of sheared bolts or stripped threads
- Inexperienced operators learn nut running operations faster
- Less product failure

CP Torque Control Impact Wrenches give you the exact tightness you want in a fast, accurate, "one-shot" rundown that doesn't require a hand torquing follow-up to check work accuracy. Torque ranges from 15 to 600 foot pounds available.

Let a CP Fastener Specialist work with you on your problems. You'll be impressed by the easy handling qualities of these unusually compact tools. The torque control mechanism is totally enclosed and *all torque adjustments* are made quickly AND simply without special tools or fixtures. For further information, contact your nearest CP Office, or write: *Chicago Pneumatic Tool Company, 8 East 44th Street, New York 17, N. Y.*

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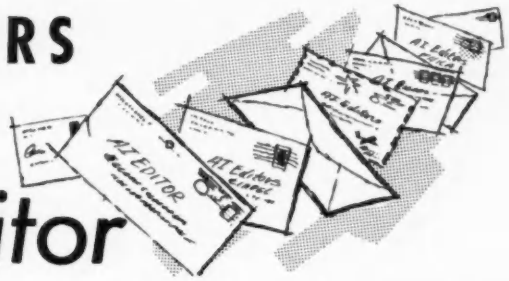
PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

LETTERS to the Editor



Readers' opinions or requests for additional information on material appearing in the editorial pages of AUTOMOTIVE INDUSTRIES are invited for this column. No unsigned letters will be considered, but names will be withheld on request. Address *Letters to the Editor*, AUTOMOTIVE INDUSTRIES, 56th & Chestnut Sts., Philadelphia 39, Pa.

THREADED FASTENERS

In the June 15 issue of Automotive Industries there is an article entitled "Research into Threaded Fasteners Pays Off for Buick." You state that the results obtained from the tests inaugurated by the Buick Division of General Motors Corp. are available upon request. We certainly would appreciate a copy of these results.

Willard Krieger
Assistant Chief Engineer
B. K. Sweeney Mfg. Co.
6300 East 44th Ave. at Monaco Blvd.
Denver 16, Colo.

● *Suggest you write to Mr. Jerry Hagan, Jr., Public Relations Dept., Buick Motor Div., General Motors Corp., Flint 2, Mich.—Ed.*

VACUUM METALLIZING

The article on Vacuum Metallizing in the August 1 issue of AUTOMOTIVE INDUSTRIES certainly presented what appeared to be an objective analysis of the vacuum metallizing process and its current status-advantages, as well as shortcomings for automotive applications.

V. N. Musmanno
Advertising & Market Development
F. J. Stokes Corp.
5500 Tabor Road
Philadelphia 20, Pa.

SURPLUS ARM RESTS

We have at this Works, for quick disposal, the following material which is considered obsolete:

1120 pcs. — Part 191964-R91, Arm Rest
441 pcs.—Part 198098-R91, Arm Rest

Please submit your best price offer together with F.O.B. Point on any of the material you can use.

If unable to use, can you rework into present part you are now furnishing us and advise cost for rework? We also request that you investigate any possibility of rework to any other usable part or a teardown of usable components. Credit to be allowed for any salvage.

C. E. Ballentine
Purchasing Dept.
Springfield Works
International Harvester Co.
2069 Lagonda Ave.
Springfield 99, O.

● *Interested, readers?—Ed.*

CASE HARDENING

The Sept. 1 issue of AUTOMOTIVE INDUSTRIES contains a paragraph in the Tabloid column on page 42 referring to the A. F. Holden Co. laboratories. Would you be kind enough to furnish us with their address?

R. E. Werdine
Engineering Dept.
Joy Mfg. Co.
900 Woodland Ave.
Michigan City, Ind.

● *A. F. Holden Co. is located at 1431 Schaefer Highway, Detroit 27, Mich.—Ed.*

HYDRAULIC TRANSMISSION

Permission is requested for reproduction of the article entitled "New Hydraulic Transmission," published in the March 1, 1957 issue of Automotive Industries.

John W. Poteet, Jr.
Supervising Attorney
Chief, Legal Office
Corps of Engineers, U. S. Army
Engineer Research and Development Laboratories
Fort Belvoir, Va.

● *Permission granted—Ed.*

in fasteners Southern is

GROWTH

Someone has said that it is no longer possible for business to stand still, for those which are stationary are left behind by those who are "on the **grow**." Southern Screw Company's **growth** in a comparatively short time is due to its ability to make better products for **growing** customers. Southern is dedicated to making better fasteners, giving better service, providing better packaging—at prices that are fair **and** competitive. It is not strange that Southern Screw's **growth** has kept pace with those we serve.

If yours is a **growth** company, Southern Screw in all probability is having an important part in your progress. If we are not now growing with you, perhaps it would be mutually beneficial to become a part of each other's **growth** pattern.

Direct your inquiries for quotations and samples to Southern Screw Company, P. O. Box 1360, Statesville, North Carolina.

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Then Weirton hot- or cold-rolled sheet is for you, too. It brings you the triple advantages of uniform gauge, uniform strength, uniform ductility. It holds up under your toughest fabrication steps, helps you turn out a better product at lower cost. And it'll prove itself in your product, just as it has in thousands of others.

Weirton produces top quality sheets to serve the needs of modern fabrication. For prompt and complete information, just phone or write Weirton Steel Company, Dept. T-4, Weirton, West Virginia.

WEIRTON STEEL COMPANY

WEIRTON STEEL COMPANY
WEIRTON, WEST VIRGINIA
a division of
NATIONAL STEEL CORPORATION

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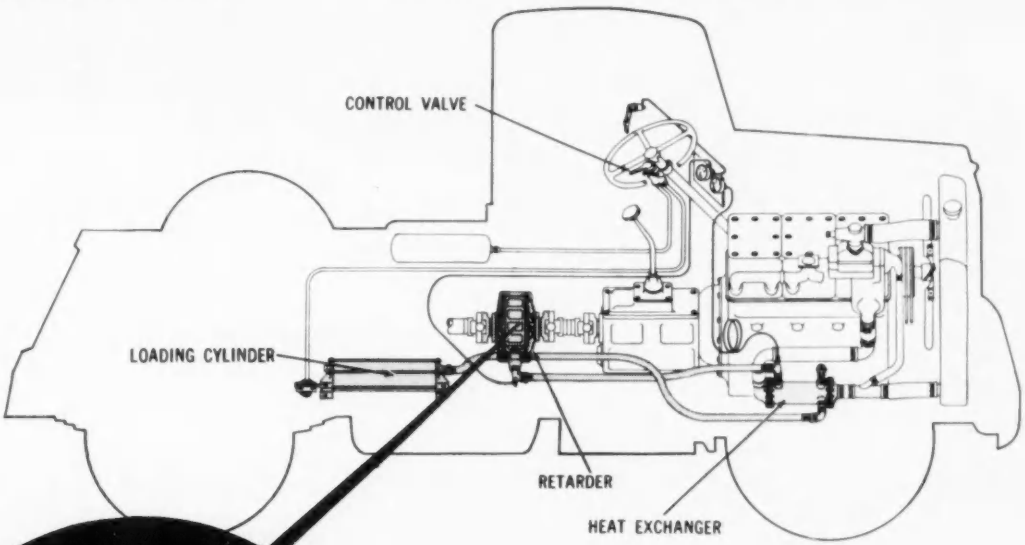
It's Dynamic...

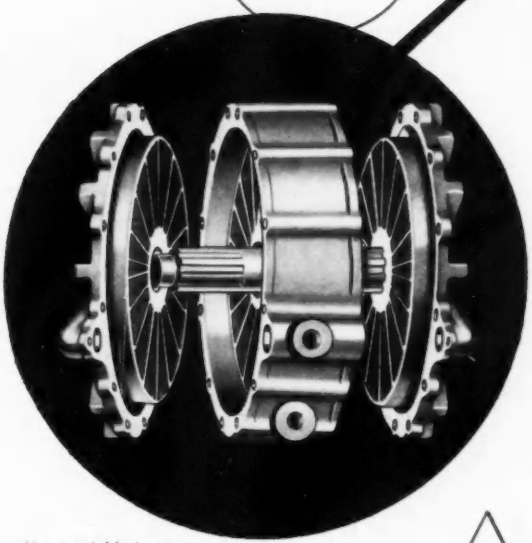
LEADING TRUCK MAKERS ADOPT THOMPSON RETARDER

New dynamic system cuts speed without use of brakes, means new safety and economy for users

Several leading truck manufacturers are offering the new lightweight, low cost Truck Retarder, developed and manufactured by Thompson's Michigan Division. This new, auxiliary system gives drivers better control of their vehicles, helps prevent "runaways". Service brakes remain cool and ready for emergency stops.

Users report major savings through substantially reduced brake maintenance costs, increased tire life, faster trips and less engine maintenance. Safety is increased, costs are reduced.





Also available in rear axle mount.

SIMPLE TO OPERATE... SIMPLE TO MAINTAIN...

To slow truck, driver moves air control valve. This connects normal air supply with loading cylinder in which fluid is stored. Air causes piston in loading cylinder to force fluid into the retarder unit. Unit is comprised basically of a rotor and stator with radial fins. Rotor is attached to the drive line. Stators which comprise the outer housings are mounted between the frame rails on a cross member. Fluid injected from loading cylinder absorbs energy through fluid friction due to the action of fluid reacting between stator and rotor. Heat is dissipated by fluid circulating through heat exchanger. *Retardation is immediate and positive.*

For complete information concerning the Thompson Retarder, write or call for illustrated brochure.

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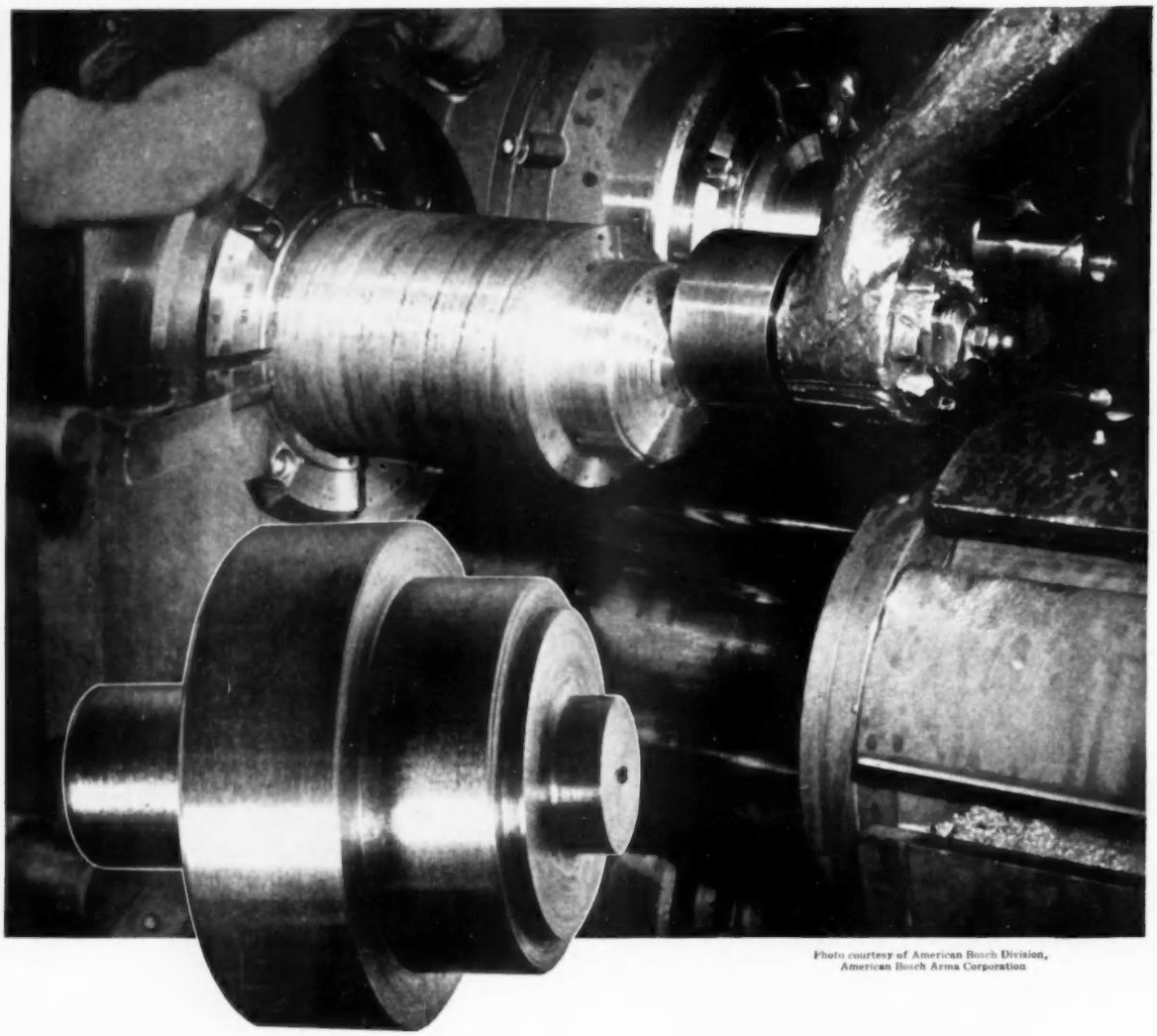

Photo courtesy of American Bosch Division, American Bosch Arma Corporation

Leaded Nitralloy Takes a Big Bite Out of Machining Time!

By switching to Nitralloy Leaded for this hydraulic head, secondary lathe operations and expensive heat treatment were completely eliminated. Produced in a single machining operation, the part is now sent directly to the grinding department. Spindle speeds and feeds were also increased.

For complete information about other fast-machining Aristoloy leaded steels or standard carbon, alloy and stainless grades, call the Copperweld representative in your nearest large city. Or write for booklet entitled, "A Complete Line of Leaded Steels," and NEW PRODUCTS & FACILITIES CATALOG.

ARISTOLOY STEELS

COPPERWELD STEEL COMPANY

ARISTOLOY STEEL DIVISION • 4025 Mahoning Ave., Warren, Ohio • EXPORT: Copperweld Steel International Co., 225 Broadway, New York 7, N. Y.

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NEWS

Vol. 121, No. 7 October 1, 1959

Steel Shortage Hurts

Crippling Shutdown of Car Production Possible Even if Settlement Imminent

The automobile industry is faced with the possibility of a crippling shutdown on the heels of a marathon national steel strike. Regardless of how soon the steel deadlock is broken manufacturers are running out of their prime raw material. A shutdown for four or five weeks does not seem out of the question for several car makers.

Automotive sources in Detroit are picking Oct. 15 for settlement date. Even Federal intervention could not bring a return to work much before that date. But shutdowns at the basic manufacturing level began in late September, and more are imminent.

General Motors is suffering most. Before the end of September, production was curtailed and workers furloughed at GM's Ternstedt, AC Spark Plug, Central Foundry, Saginaw Steering, New Departure, Hyatt Bearings, and Harrison Radiator divisions.

Chevrolet general manager Edward Cole said most of the Chevrolet assembly plants will be shut by Oct. 20. The three Corvair plants were expected to close down by the end of the month, if the strike had not ended by Oct. 1. Chevrolet manufacturing plants, he indicated, will close even sooner.

A settlement by mid-October would mean steel companies could not begin to ship until the first part of November, figuring three weeks to get the idle mills rolling again. Then the car companies' basic manufacturing plants and, more important, parts suppliers would have to begin filling the pipelines that are fast running dry. GM divisions have said repeatedly that they have enough steel to "sample the dealers." But no one except Cole has ventured a deadline beyond a mere sampling.

Ford and Chrysler appear to be in better shape than GM. A Ford spokesman said that his company would not be hurt if a settlement came as late as Oct. 15. Chrysler still maintains it can build cars into November.

Meanwhile, the car companies are taking steps to keep their assembly lines humming. Agents are scouring the country for warehouse steel, and paying premium prices to boot.

Chrysler and GM both have taken steps to secure outside steel, Chrysler from a Texas steel company and GM from a Pa. source.

Ford Motor Co. has reopened its River Rouge rolling mill, idle for nearly three years. This move will give Ford a supply of 14 in. bar stock, but will not effectively increase steel output.

GOER PLOWS THROUGH MUD WITH EASE

Army's new experimental high-mobility truck, the GOER, operates cross-country, snakes through mud, and "swims." LeTourneau-Westinghouse has made the vehicle in two test-bed versions—a 5000-gal tanker (illustrated) and a 15-ton cargo model. Details will be presented in an early issue.

Chrysler Makes Strong Bid for 1960

Chrysler Corp. is taking a big step in introducing its new line of automobiles for 1960, a step president L. L. Colbert says carries a $350 million price tag.

The Corporation is bringing out Chrysler, De Soto, Dodge, and Plymouth automobiles with completely new unitized bodies, key engineering changes (see AI, Sept. 15), and fresh, although not radically different, styling approaches. In addition, Chrysler is introducing two new lines, the Dodge Dart and the small Valiant.

Cash Outlays High

To bring out these cars, says Colbert, Chrysler is spending $350 million. This figure includes development, tooling, plant conversion and other make-ready costs. Plant conversion alone, triggered by the switch to unit body construction on all but Imperial, is costing an estimated $80 million.

The Valiant reportedly cost $100 million to develop and tool. The small car engine, however, is virtually indentical to the new Plymouth Six and Dart powerplants, even to the common bore of 3.4 in. Engine development cost becomes a nebulous figure assigned somewhat proportionately to three different automobiles.

Styling changes include new fin treatments (Plymouth's are higher, Dart has none), new grilles, and thinner pillars. A sculptured fender and panel are especially noticeable on Plymouth.

Chrysler is counting heavily on the Dart for deeper penetration in the volume field dominated by Chevrolet and Ford. A realignment of dealers will cut the number of Plymouth outlets to about 4000 by mid-October, giving Dodge and Dart a stronger relative position within the Corporation. In other words, Dart should give staunch old Plymouth a real "run for the money."

First of the Corporation cars to make its showroom appearance will be Imperial on Oct. 2. Dodge, Dodge Dart and Dodge truck will follow Oct. 9, with Plymouth, Chrysler and De Soto scheduled to bow Oct. 16. Valiant is slated for public introduction Oct. 27.

Colbert, speaking at a news preview of the Chrysler lines Sept. 17 in Miami Beach, predicted a bright future for Valiant. He said 1960 could bring total sales of about 1.25 million American-built economy cars. Sales might be determined largely by the various companies' manufacturing capacities.

Colbert predicted new car sales of between 6.5 and 7 million during 1960, with about 500,000 imported cars. This would compare with anticipated sales of 6.4 million cars in 1959, including 600,000 imports.

Valiant at one time was considered by some Detroit sages as a Chrysler after-thought, designed on a "me too" basis to keep up with Ford and GM. It turns out to be "better powered" than either Falcon or Corvair, about as roomy, and just as well styled. Valiant also has one very important edge—a station wagon.

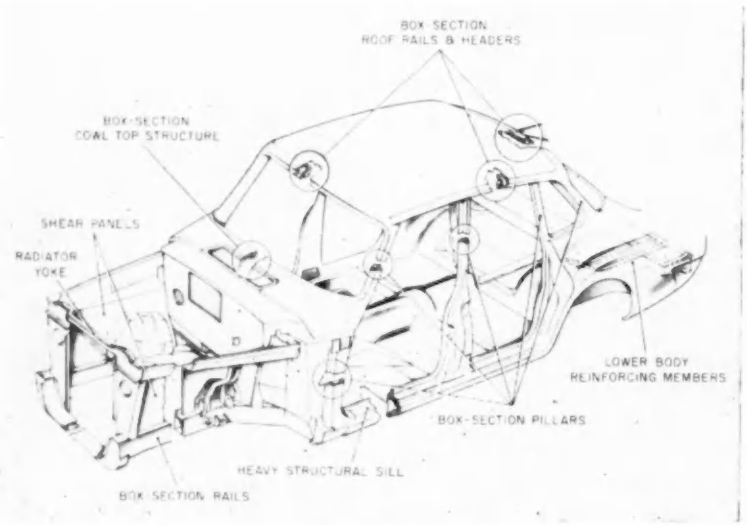
Details of Valiant

Before the end of 1959, Valiant will offer its suburban two-and three-seat wagons in both the V-100 and V-200 series. Neither Falcon nor Corvair has announced plans for a station wagon, and neither is expected to market one for some time.

Rambler, which has sold more than 40 per cent station wagons, has proved there is a strong market for a wagon in the compact car price class. The Valiant wagons measure 185.1 in. overall, or 1.1 in. more than the four-door sedans. Other dimensions are the same: 106.5 in. wheelbase, 70.4 overall width, 53.3 in. height.

Valiant will be powered by a 170 cu in. displacement OHV six-cylinder engine with compression ratio of 8.6 to 1 and bore and stroke of 3.4 by 3.125 in. Horsepower is a closely guarded secret until the first advertising broadsides, but it is expected to be around 100. Valiant, like other 1960 Chrysler Corp. cars, is equipped with a 12-volt electrical system and an ac generator.

William C. Newberg, Chrysler executive vice-president, told newsmen previewing the Valiant that the new car has been road tested to 30 mpg and better. He said the corporation is building Valiants in Hamtramck, Mich., and will be building them in St. Louis after Jan. 1. Chrysler will be able to build 300,000 a year, he added.



Valiant unitized body construction.

GM Holds Price Line

General Motors, first to announce prices on 1960 model automobiles, is doing something "they said couldn't be done"—holding prices to 1959 levels. A few months ago, Detroit speculators were predicting general price increases for the industry, saying that steel and wage boosts would force an increase.

GM, however, has announced that prices are unchanged for all Pontiac, Cadillac, and Oldsmobile models. Increases of $15 for Chevrolet Biscayne and Brookwood station wagon models, and hikes of from $15 to $61 on Buick Le Sabre models were the only changes announced.

But Buick, Pontiac, Oldsmobile, and Chevrolet all have included as standard equipment some items which were extra cost options in 1959. This, in effect, lowers the list price of the automobile.

The possibility of an upward adjustment following the steel settlement is not out of the question. However, as one Detroit labor expert explains it, the steel companies may be forced to grant wage increases without raising prices.

This would follow the pattern set by the automotive, aircraft, and other major industries during the past year. These industries granted "non-inflationary" wage increases based on improved productivity. Hence, GM was able to hold its prices down on 1960 models, despite the higher labor costs.

Studebaker-Packard Corp., on the other hand, raised its prices for 1960 from $8 to $55. But S-P, like GM, has made some items standard that were not before.

Chevrolet Adds Space

Chevrolet is adding 35,000 sq ft to its engineering center at Warren, Mich. The new footage will allow more drafting area and work space. A product display area also is in the works.

1960 CORVETTE POWER TRAINS

Engine	Equipment	Compression Ratio	Gross HP—RPM	Gross Torque—RPM	Net HP—RPM	Net Torque—RPM	Transmission	Axle Ratio
Regular Production 283 Cu. In. V-8	4-Barrel Carburetor	9.5	230 @ 4800	300 @ 3000	**195 @ 4600	270 @ 2800	3-Speed 4-Speed Powerglide	3.70* 3.70* 3.55
Optional 283 Cu. In. V-8's	Two 4-Barrel Carburetors	9.5	245 @ 5000	300 @ 3800	**215 @ 4800	270 @ 3400	3-Speed 4-Speed Powerglide	3.70* 3.70* 3.55
	Two 4-Barrel Carburetors and Special Camshaft	9.5	270 @ 6000	285 @ 4200	**230 @ 6000	255 @ 3800	3-Speed 4-Speed	3.70* 3.70*
	Fuel Injection	11.0	275 @ 5200	305 @ 4400			3-Sped 4-Speed	3.70* 3.70*
	Fuel Injection and Special Camshaft	11.0	315 @ 6200	295 @ 5100			3-Speed 4-Speed	3.70* 3.70*

* With Positraction rear axle, optional ratio of 4.11 or 4.56 may be selected.
** Dual exhaust system.

1960 CORVETTE HAS MECHANICAL CHANGES

Except for color treatment, the 1960 Chevrolet Corvette is offered without change in exterior appearance. Major points of interest are the mechanical improvements.

Design changes give improved oil economy and cooling for Corvette engines. Improved handling, greater roll stability, a quieter ride, and better distribution between front and rear wheel braking all stem from changes in the chassis system.

Cylinder heads of Corvette engines have been modified by altering their top contour to improve fuel economy. Drainage of oil from the top of each head is facilitated by a longitudinal groove along the outer edge, leading to drain-back holes. Ridges around the valve spring seats are made lower and are truncated at the oil drain groove.

On fuel injection engines, the cylinder heads are of aluminum, and embody the same improvements for oil drainage. The aluminum heads provide a saving of 53 lb.

Performance of fuel injection engines is improved by revision of intake valve porting and enlargement of the valves. The intake maniold also has been modified so as to enlarge the volume of the plenum chamber. The changes in heads and manifold improve the volumetric efficiency of the fuel injection engines, particularly at higher speeds. The manifold adapter has been suitably modified.

Fuel injection this year is restricted to Corvettes with manual shift transmissions. Performance is further enhanced by increasing compression ratio, together with newly designed domed pistons which are supplied on both regular camshaft and special camshaft fuel injection engines.

Use of aluminum has been extended by the adoption of an aluminum clutch housing for both the three- and four-speed manual shift transmissions. It is used on both carburetor and fuel injection engines and provides an extra weight saving of 18 lb.

Engine cooling is improved by moving the fan 1 15/16 in. closer to the radiator, making it possible to use a shallower fan shroud. For increased cooling capacity of the high performance engines, there is an option of an all-aluminum crossflow radiator which is made available only with special camshaft engine options.

On the chassis, a stabilizer bar added immediately to the rear of the rear axle, increases stability and makes it unnecessary to use heavy-duty springs and shocks.

NEWS

CONTINUED

"Flying Duck" Hits Water Speeds of Up to 50 Mph

The Army, in quest of increased mobility, has unveiled a novel truck that floats like a boat and "flies" like an airplane. Dubbed the "Flying Duck," it was developed by the Lycoming Div. of Avco Corp. under a contract with the Army Ordnance Corps. It is a gas-turbine-powered, hydrofoil version of the World War II DUKW amphibious landing craft.

The "Flying Duck" uses its 860-hp Lycoming gas turbine engine in combination with aerodynamically shaped hydrofoil wings to attain water speeds up to 50 mph. The vehicle flew successfully for the first time recently at the test site of Miami Shipbuilding Corp. a major participant in the development program.

On water, the "Flying Duck" begins operations in much the same fashion as a conventional boat. However, when it reaches a speed of five mph, the water flowing around the hydrofoil wings, which are extended below the surface, acts in the same manner as does air flowing past an airplane wing. The pressure above the foil is reduced in relationship to the pressure below, giving lift.

At 13 mph this lift is sufficient to raise the vehicle well out of the water. At full flight condition, the hull is more than four ft above the surface. The three hydrofoils, two forward and one at the rear, travel approximately 30 in. below the surface.

With the hull completely out of the water, more than 60 per cent of the drag normally associated with boats is eliminated, thereby allowing the sizable increase in speed. An automatic pilot senses the waves ahead and then controls the foils to compensate for any variations, even in relatively rough water. The two forward foils are hinged at the rear to allow for either automatic or manual control of the angle of the hydrofoils.

Wheels free, the 26,000-lb converted World War II DUKW, nicknamed the "Flying Duck," begins its hydrofoil flight. The Lycoming T53 gas turbine engine is installed with the power turbine shaft facing the rear. It is coupled directly to the gear box of the over-the-stern drive. A 3000 psi hydraulic pump is mounted above the engine shaft.

The "Flying Duck" uses a multi-fuel engine which is capable of operating on Diesel fuel, kerosene, gasoline, jet fuels, or any combination of these. The Lycoming T53 engine is the same model currently being used in the Army's new Bell HU-1 helicopter and Grumman AO-1 observation aircraft. This marine version is its second industrial usage, and is expected to find wide acceptance for more numerous ground applications.

By way of an interesting sidelight, Reynolds Metals Co. and Dynamic Developments, Inc., a division of Grumman Engineering Corp., have announced the availability of aluminum hydrofoils for civilian marine pleasure craft. Designed and engineered by Dynamic Developments and produced by Reynolds at Louisville, Ky., the hydrofoils are being marketed in "do-it-yourself" kits at a suggested retail price of $390.

Ford Blankets Field

Ford Div. is attempting to cover the field with its 1960 array of automobiles, according to division general manager J. O. Wright. He says the 1960 line will spread over 90 per cent of the car market, from Falcon to Thunderbird.

The standard Ford line for 1960, Wright told a news conference, originally was planned for a future year, but design was pushed ahead to give a roomier car on a new body shell for 1960. As a result, he pointed out, the new Ford has more shoulder room, hip room, leg room, and head room than the 1959 models.

The Ford Thunderbird for 1960, also shown for the first time at the news conference, is introducing a new automatic soft top for the convertible and a sliding sun panel for the hardtop model.

Circle 117 on Inquiry Card for more data ⟶

Quality in Ascendancy

The superiority of the vast number of products that are—and can be made from Roebling Cold Rolled Flat Spring Steel is a fact known throughout all industry.

You pay for mechanical and dimensional uniformity when you buy flat spring steel...you *get* it when you buy Roebling.

For information on how our products can help *yours*, write Wire and Cold Rolled Steel Products Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

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PROCESSES

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EQUIPMENT **SUPPLIES**

Now—from Allied Research

—a new systems concept for the finishing of metals.

Process Engineering Service

The first—and only—service built around the most important part of your operations . . . your process requirements.

Why a PROCESS Engineering Service?

Allied Research's long and broad experience in helping customers solve process and equipment problems of all types has led to one important conclusion:

Only by integrating equipment with your particular process are you assured of getting these important benefits from your operations: (1) higher production, (2) greater efficiency, (3) lower operating costs, (4) consistent product quality.

Our success in helping our many customers reach these important objectives has prompted us to offer this unique service to the entire metal finishing industry.

What does our Process Engineering Service consist of?

CONSULTATION—Experienced representatives will assist you in properly planning any part of or all your process and equipment requirements.

RECOMMENDATION—Trained engineers will recommend the particular process, equipment and chemicals to provide you with the best in operating efficiency and economy for your specific production requirements.

INSTALLATION—Planned, engineered and supervised—including plumbing, electrical, ventilation and disposal requirements—or whatever else is needed to assure efficient and proper operations.

SERVICE—Field Engineers insure proper start-up and will make necessary maintenance recommendations. They are available for periodic check-up.

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NEWS

FEATURES

Lark Prices Disclosed

Factory list prices for 16 body styles of the Studebaker 1960 Lark by Studebaker range from $1,793 for the two-door DeLuxe six-cylinder sedan to $2,510 for the Regal V-8 softtop convertible. The Studebaker Hawk, a family sports car with a larger V-8 289-cu in. displacement engine for 1960, lists for $2,411.

List prices announced include some standard equipment items which were optional at extra cost on 1959 models. Local or Federal taxes, transportation and dealer preparation for delivery are not included in list prices.

LARK PRICES

DeLuxe Six	
Two-door sedan	$1,793
Four-door sedan	1,858
Two-door station wagon	2,155
Four-door station wagon	2,224
Regal Six	
Four-door sedan	1,992
Two-door hardtop	2,085
Four-door station wagon	2,359
Two-door convertible	2,386
DeLuxe V-8	
Two-door sedan	1,911
Four-door sedan	1,976
Two-door station wagon	2,273
Four-door station wagon	2,343
Regal V-8	
Four-door sedan	2,115
Two-door hardtop	2,208
Four-door station wagon	2,482
Two-door convertible	2,510

AC Spark Plug Builds

Three building projects have been announced by AC Spark Plug Div. of General Motors Corp. Preliminary construction work will begin in the near future, and completion in expected during 1960.

The new Studebaker Lark convertible for 1960 is offered with six- or eight-cylinder engines. A choice of manual, overdrive or automatic transmissions is also available.

The division will build a 400,000 sq ft shipping and warehousing structure in Flint, Mich., add about 61,500 sq ft to its Flint automotive engineering building, and construct a 215,000 sq ft addition to its Oak Creek, Wis., missile guidance plant.

Chrysler in Argentina

Chrysler International is launching a $15 million program to tool for 1960 model trucks in the Argentine.

The program, approved by the Argentine government in late August, involves two lines of Chrysler-designed trucks, the D-100 5100 GVW and the 1½ ton D-400 15,000 GVW unit.

Chrysler plans call for assembly of 4000 trucks the first year and eventual production of 8000 units. Work will be carried out at the plant of Fevre y Basset near Buenos Aires. Fevre y Basset has handled Dodge vehicles since 1916 and all Chrysler products since 1929.

A new company, Chrysler Argentina, is being formed to assist in financing and other details. A 30,000 sq ft addition to the Fevre y Basset plant, already over half-million feet, will be built for transmission and axle assembly.

Chrysler will import more than 400 new machines, fixtures, gages, special tools, and other equipment for truck engine production. The program will begin with 45% Argentine content, building up to 70% within the next four years, according to present plans.

Predict Record Tire Sales

Record sales of automobile replacement tires are predicted for 1960 by O. E. Miles, vice president in charge of trade sales at Goodyear Tire & Rubber Co. Miles foresees sales of 66 million units this year jumping to 68 million in 1960.

TABLOID

A new polycrystalline ceramic that readily transmits light has been made from powdered aluminum oxide. A General Electric development, the material also has high strength, strong heat resistance and ease of fabrication. Potential areas of application for Lucalox, as GE calls the new material, include high-temperature lamps, electrical insulation, and gem bearings in delicate equipment.

* * *

Mercast Corp. has come up with a new method of casting metal in a "shell," with a ceramic mixture to permit faster casting and lower cost for many aircraft, missile, and electronic parts. The "Ceramercast" method permits the casting of configurations too large and too complicated for lost-wax molds, and supplements the frozen mercury process in fabricating complicated or large castings. It has commercial non-defense uses with a variety of metals, as well as marine applications for casting stainless steel.

* * *

The Research Div. of New York University's College of Engineering reports development of a new titanium alloy described as "far superior in strength, ductility, and toughness" to any comparable alloy now commercially available. The alloy is the result of three years of research sponsored by Watertown Arsenal Laboratories. It is nominally composed of 6 per cent aluminum, 6 per cent vanadium, 2 per cent tin, 0.5 per cent iron, 1.25 per cent copper, and 85.25 per cent titanium.

* * *

Hard-to-weld thin gage materials can be welded by a machine developed by the U. S. Army Engineer Research and Development Laboratories, Fort Belvoir, Va. Trailer-mounted and gasoline-engine driven, it is a shielded inert gas arc welder that differs from the conventional dc welder in that it furnishes both ac and dc welding current for metallic arc or tungsten inert gas welding.

Rigid urethane foams based on polyethers can be sprayed readily with a process developed jointly by Wyandotte Chemicals Corp. and the De Vilbiss Co. The portable, low-cost spray system produces rigid foams which are self-adhering, tack-free in less than five minutes, and have outstanding insulation efficiency. It is based on two components of low viscosity and can be carried out successfully with standard paint spray equipment, excepting the gun itself which was specifically developed for this use by De Vilbiss.

* * *

Cast iron inserts may be bonded into aluminum die castings with a new method developed by Doehler-Jarvis Div. of National Lead Co. The new bond is a mechanical interlock of the two metals and is called the B.M.I. bond (Bi-Metallic Interlock Bond). It results in high tensile and shear strength and has the ability to withstand combined stresses. Applications in which use of the new insert bonding methods are indicated include cast iron cylinder liners for aluminum engine blocks and cast iron brake liners for aluminum brake drums and wheels.

* * *

The use of ultrasonics to eliminate porosity, increase surface hardness, and greatly improve the quality of non-ferrous die castings is under investigation by American Charcoal Co. Experiments already concluded indicate that by using sound waves to "shake" the metal molecules together at the instant the molten metal becomes a solid, the resultant die casting is almost totally free of porosity; denser, thus stronger; and far closer dimensional tolerances can be achieved with a minimum of rejects.

* * *

The Cellular Plastics Div. of The Society of the Plastics Industry, Inc., has formed a Public Relations Committee to promote greater public acceptance and understanding of cellular or foamed plastics.

Dow Sets Up New Firm

A new division of the Dow Chemical Co., The Dow Metal Products Co. has been created to specialize in the semi-fabrication and forming of magnesium, aluminum, and other metals. The new division will have facilities for producing rolled and extruded products; sand and permanent mold castings; die castings; and fabricated assemblies. This activity will greatly broaden Dow's participation as a supplier to the metalworking field.

Harrison Adding Space

Plans for the immediate construction of a 180,000 sq ft warehouse and a 200,000 sq ft manufacturing building at the West Lockport, N. Y., plant of the Harrison Radiator Div., General Motors Corp., have been announced.

The two new, one-story modern brick and steel buildings will be erected directly adjacent to the plant. The additions are being made to meet Harrison's need for centralized warehouse facilities and additional manufacturing area to handle increasing demand for automative air conditioners.

New Differential Out

The Pump Div. of Eaton Mfg. Co. has developed and is producing a controlled slip differential for passenger cars and trucks. At the same time, plans for expanding the facilities of the division at an estimated cost of $450,000 to provide the necessary space for production of this differential and for future new products were announced.

The new differential is being produced for one of the Big Three automobile companies to be offered as optional equipment on a light truck in its 1960 line. Other manufacturers are testing the device in their vehicles.

On slippery pavement or in mud, Eaton's controlled slip differential acts to increase the torque of the high traction wheel while minimizing slippage on the low traction wheel. The vehicle is thus able to move forward with greater ease. An exclusive clutch disk design is said to assure chatter-free operation and long performance life.

Chrysler Lights Up

Instrument clusters of 1960 Chrysler and Imperial cars are illuminated by a new no-glare light source. Called electroluminescent lighting (EL)—or planelescent lighting in its automotive application—it is produced by sending electricity through phosphor. Big advantage of EL, said to last 10 times longer than the conventional incandescent bulb, is reduced eye strain in night driving.

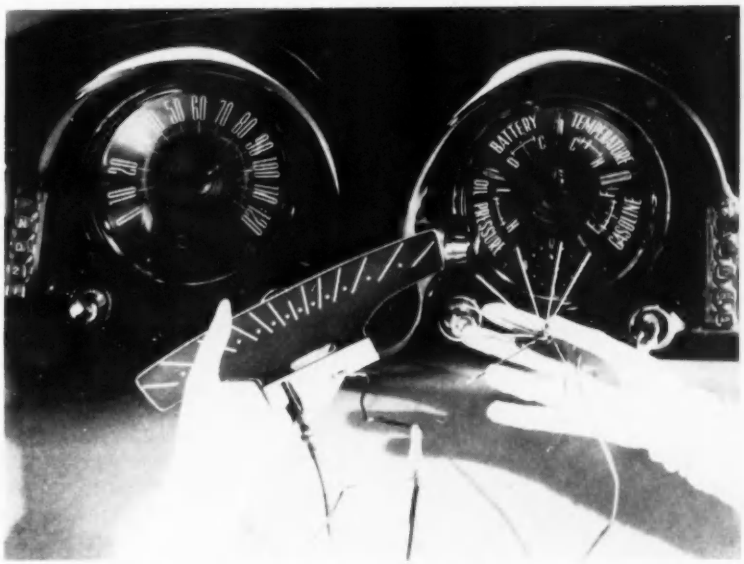
The new light source is a joint development by Chrysler Corp. and Sylvania Electric Products, Inc. EL lamps are manufactured by the latter firm at Salem, Mass. Other potential automotive applications include automobile ceilings, floor lights, and license plates.

Two types of EL lamps are used in the Chrysler and Imperial clusters. The numerals and letters on the speedometer, odometer, fuel, amperage, oil and temperature gages, and radio dials are backlighted by flat, wafer-thin EL lamps that produce a blue-green light. Moving across the dial faces are flowing pointers in contrasting colors, to give the driver the information he wants at a glance. Both the pointers and flat pieces are EL lamps containing phosphor.

The EL lamp is a piece of thin durable metal usually cut in rectangular shape. The metal is coated with several ceramic layers including glass-based, electrically-conducting material and electroluminescent phosphors, all heremetically sealed in transparent glass. Total thickness of all layers applied to the metal base is less than one-fiftieth of an inch. The treated metal is wired in conventional manner and connected to an ac power source.

The 1960 Chrysler instrument panel's three-dimensional design was made possible because of the new EL light source. A transparent half-sphere, satin finished in brushed aluminum, is centered beneath steering wheel. Four strips of aluminum rise from within the sphere to form engine gage indicators—oil, generator, temperature, and fuel. EL pointers and a variety of numerals and letters are backlighted by small EL panel lights. Radio and clock faces are also illuminated through electroluminescence.

The instrument panel for the 1960 Imperial has two large, circular instrument clusters flanking the steering column. Each cluster, the speedometer group on the left and the engine gage group on the right, is individually hooded by a semi-circular brow flowing out the panel's leading edge.

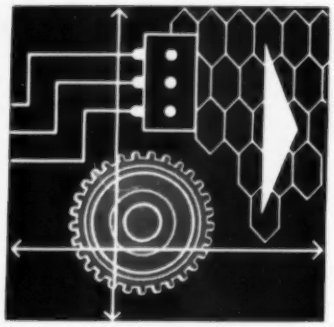


These hands hold EL lamp and EL pointers similar to the ones used in the 1960 Imperial instrument panel in background. EL lamp at left shows simplicity of wire attachment. Only line-and-dot light shows through plastic masking overlay applied to lamp's surface. Pointers at right are individually wired for illumination. 1960 Imperial instrument panels will use 21 EL lamps and pointers, while 1960 Chrysler will employ 15 in its panel.

Mercury Outboards Bow

The 1960 line of Mercury outboard engines (in power classes ranging from 6 to 80 hp) includes nine new models, headed by the 80-hp Merc 800. Engineering improvements throughout the line, quieter operation, and single lever operation for all remote-controlled engines were announced by the Kiekhaefer Corp.

With the introduction of the 800, Mercury now offers five engines for crusing, water skiing and offshore fishing. These are: the four-cylinder-in-line 35-hp Merc 300 and 45-hp Merc 400; the six-cylinder-in-line 60-hp Merc 600, 70-hp Merc 700, and the Merc 800. All are available as electric starting models with a built-in alternator-type generator. Long shafts for boats with 20-in. are optional on all these engines. For fishing and smaller runabouts, four two-cylinder models round out the line: the 22-hp Merc 200, 15-hp Merc 150, 10-hp Merc 100, and the 6-hp Merc 60.



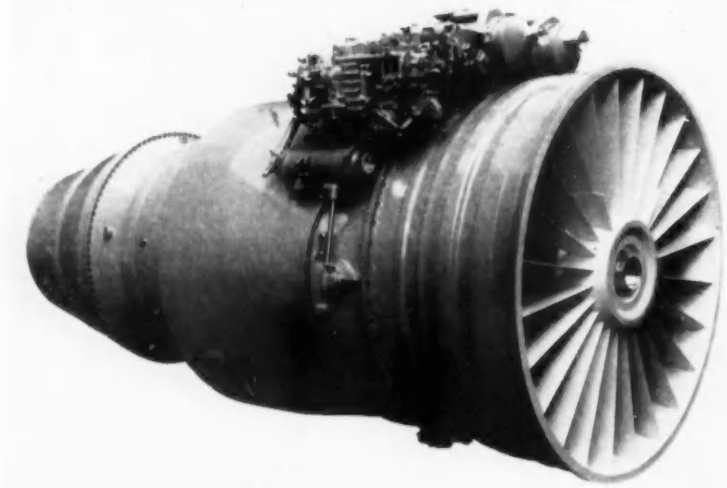
AVIATION
MANUFACTURING

Farnborough Show Reflects State of British Industry

This year's Farnborough Air Show in September reflected the difficult period of transition through which the British aircraft industry is passing. In 1957, it was caught unprepared by the radical shift in the Government's defense policy, which scrapped future plans and orders for manned fighters and bombers in favor of guided weapons.

Since then it has been sustained largely by a backlog of unfilled domestic orders for existing planes with little prospect of repeats, and by exports. Fortunately, overseas sales (with engines accounting for a third of the total) have climbed to record levels. At the same time, however, employment in the entire field of aircraft manufacturing has declined. As a result, a number of companies have taken on non-aviation sidelines, and there has been a flurry of mergers and working agreements within the industry.

Hope for the future is clearly in the field of civil transports, especially jet, as evidenced by the exhibits at Farnborough. Despite the uncertain outlook for the British aircraft industry, a record number of 376 exhibitors took part in the exposition. The showing, however, was relatively weak in view of the shortage of planes currently available for the new era of commercial transport. To underline the interim nature of the display, a number of manufacturers chose this occasion to announce or elaborate on their forward projects.



Bristol Siddeley BE 58 ducted fan engine, rated at 14,500 lb thrust, has a cold-flow ratio of 1.5 to 2.

New Planes

It was revealed that the Hawker Siddeley Group and Bristol Aircraft may collaborate in the design of Britain's first supersonic airliner. As a pilot project, Bristol is already building the Type 188 all-steel research craft for Mach 2.5 operation, which is scheduled to fly next summer.

Vickers Armstrong disclosed that its 150-passenger, 600-mph VC.10 airliner is expected to have better airfield performance than any known jet with four tail-mounted Conway engines. B.O.A.C. has ordered 35 for delivery in 1963. The same company is also working on the VC.11—a scaled-down version with the same tail-engined design intended to replace the Viscounts when those turboprops end their useful life in the mid-1960's.

Airco's D.H.121 (see illustration), also aimed at this market, has been ordered by B.E.A., with deliveries of the first lot of 24 planes to start in late 1963. This has three Rolls-Royce R.B.163 bypass jets mounted in the rear and will cruise at above 600 mph with 80-100 passengers.

The Short Britannic SC.5 freighter is due to fly in 1962 and enter service with the Royal Air Force in 1964. Powered by four Rolls-Royce Tyne turboprops of 5730 ehp each, this plane is designed to carry an 85,000-lb pay-

load over 1150 miles at 340 mph.

Saunders-Roe, whose experimental Hovercraft was demonstrated at Farnborough with 20 troops standing on the saucer-like hull, displayed a model of a 400-ton craft designed to carry a 160-ton payload skimming six ft above water or flat land.

Among Britain's newest transports exhibited and flown at Farnborough was the Comet 4B, a special version built for B.E.A. Distinguishing features are a longer fuselage, a shorter wing span, and the absence of nacelle fuel tanks. It is powered by four 10,500-lb Avon RA.29 engines, the two outer ones have thrust-reversers for braking. The Comet 4B carries 102 passengers and cruises at 530 mph.

Vickers-Armstrong gave its first public demonstration of its 139-passenger turboprop Vanguard. This 425-mph plane, in fact, was the third production model, there being no prototype. B.E.A. and Trans-Canada Airlines have each ordered 20.

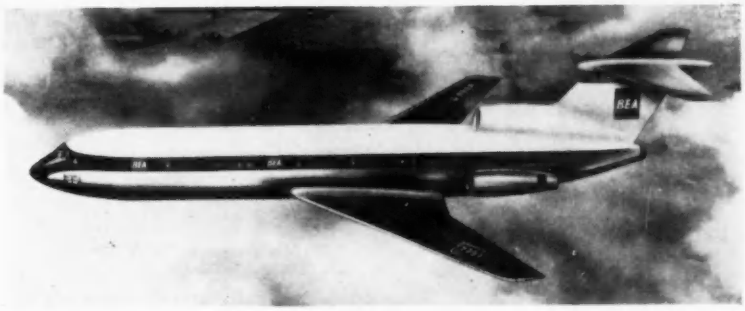
Folland displayed a two-seater trainer version of its diminutive Gnat jet fighter. Its performance characteristics are the same as the single-seater's, but wing span is 30 per cent greater, and the tail unit is larger.

Another new jet trainer shown was the English Electric P.11 derived from the Lightning, the last supersonic manned fighter ordered by the F.A.F. It has the front fuselage widened to take two ejector seats side by side, and achieved supersonic speed on its maiden flight in early May.

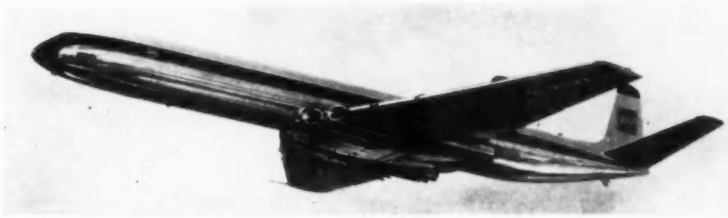
New Engines

Among the new engines on display was the Bristol Siddeley BE.58 ducted fan powerplant (see AI, Sept. 1, p. 47). This unit with a front-mounted fan and cold-flow ratio of 1.5 to 2 has a thrust of 14,500 lb for a weight of 2600 lb.

The same company for the first time exposed the innards of its Thor BT-1 ramjet engine with a cut-away model (see illustration). This unit, developing 100,000 hp at Mach 3 at sea level, has the centerbody nose cone projecting forward of the intake lip to focus primary shock waves on the lip.



Drawing of the rear-engined Airco D.H.121, designed for highly economical operation on runs up to about 1200 miles.



Comet 4B, adapted to B.E.A. requirements, has a lengthened fuselage and shortened wings. It cruises at 530 mph carrying a maximum of 102 passengers up to 2500 miles.

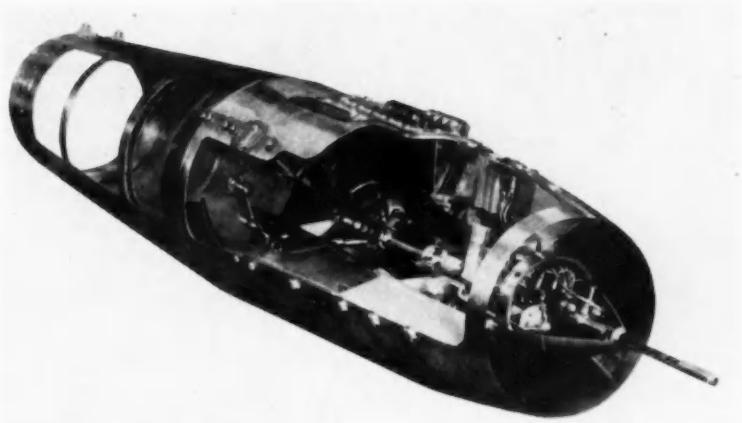
Secondary shock waves occur in the annular duct between the lip and centerbody.

Air thus slowed to subsonic speed travels down the annular passage and around the streamlined island, which is supported from the casing and contains the fuel control equipment. Fuel is injected through jets, and burning is stabilized by a V-section ring gutter. The combustion area is surrounded by a perforated damper which reduces oscillations.

Also on view at Farnborough for the first time was the Bristol Siddeley Orpheus B.Or.12. It is the latest development in the Orpheus family of lightweight medium thrust turbojets. It has a dry thrust of 6810 lb, which can be raised to 8170 lb by using a simplified form of reheat and a variable-area nozzle; bare weight is 1110 lb.

Bristol Siddeley also displayed the latest model of its Olympus

(*Turn to page* 74, *please*)



Sectional view of the Bristol Siddeley Thor BT-1 ramjet engine, which develops a sea-level output of 100,000 hp at Mach 3.

MEN IN THE NEWS

Detroit Aluminum & Brass Corp.—Ralph W. Doherty was named director of marketing.

Lindberg Engineering Co.—Leon C. Koenig has been appointed vice-president of manufacturing.

Chrysler Corp. — B. W. Bogan has been elected a vice-president and a member of the Administrative Committee and Operations Committee.

The Bullard Co. — Charles E. Alling was promoted to marketing manager.

Micromatic Hone Corp. — William J. Pinkerton is now executive vice-president, assistant general manager, and a director.

SKF Industries, Inc.—Thomas W. Morrison is now director of engineering and research.

Jack & Heintz, Inc.—**H. Chapman Rose** and **Chester A. Thompson** were elected acting chairman of the board and acting president, respectively.

Chevrolet Motor Div., General Motors Corp.—**Sylvester J. Thrasher** has become manager of the Detroit Gear & Axle and Forge plants, and **Edward Gray** succeeds him as director of quality control. **F. C. Heidel** is now national manager of the Chevrolet Business Management Dept.

Industrias Kaiser Argentina, S. A. —**J. C. Delaplain** has been named director of marketing.

American Motors Corp.—**John E. Engstrom** has been appointed manager of factory operations, automotive export.

Electric Auto-Lite Co. — **Carl P. Cronk** has been named manager of market research.

Packard Electric Div., General Motors Corp.—**William G. Heller** has been appointed divisional comptroller.

McGill Mfg. Co., Inc., Electrical Div.—**James C. McGill** has been named assistant general manager; **James S. Eason**, general sales manager; **Howard Powell**, plant manager; and **Gunnard Nielsen**, chief product engineer.

City Pattern Foundry & Machine Co., Inc.—**Hartley S. Ball** has been named president.

Rolle Mfg. Co.—**R. Carter Dye** has been elected president; **Fred H. Edgar**, executive vice-president; **William E. Nolan**, vice-president and general manager; and **Douglas D. Lawson**, vice-president in charge of sales.

Babcock & Wilcox Co., Tubular Products Div.—**F. H. Fogelsong** has been named manager of alloy sales.

Napco Industries, Inc.—**D. Edward Manning** has been appointed director of sales and marketing, and **Willard C. Nelson** has been made field sales manager.

Westinghouse Electric Corp., Sturtevant Div.—**James W. Wilcock** has been appointed manager.

Firewel Co., Inc.—**Ralph W. Morrison** has been made executive vice-president.

Vickers, Inc. — **Fred A. Klemach** has been appointed missile systems manager.

Minneapolis-Moline Co., Engineering Div.—**Robert B. Singer** has been named manager of the Experimental Dept.

Republic Aviation Corp., Missile Systems Div.—**S. Michael Treman** has been made manager of design and technical engineering.

Harrison Radiator Div., General Motors Corp.—**Wallace A. Jack** and **Frederic J. Watkins** have been appointed sales managers.

Rockwell-Standard Corp., Stamping Div.—**James A. Leake** has been appointed sales manager.

Enjay Co., Inc.—**J. P. Haworth, H. C. Evans,** and **G. M. Lowden** have been named assistant sales manager, Eastern Div. manager, and Akron District manager, respectively.

Scintilla Div., Bendix Aviation Corp.—**Edwin B. Watson** has been named chief engineer of the Diesel Dept.

Lord Mfg. Co.—**Richard C. Henshaw** has been appointed manager of operations.

Aerojet-General Corp.—**L. M. Limbach** has been named corporate director of manufacturing.

Raytheon Co.—**Richard E. Krafve** has been elected executive vice-president, and **Homer R. Oldfield** has been elected group vice-president of electronic components and devices.

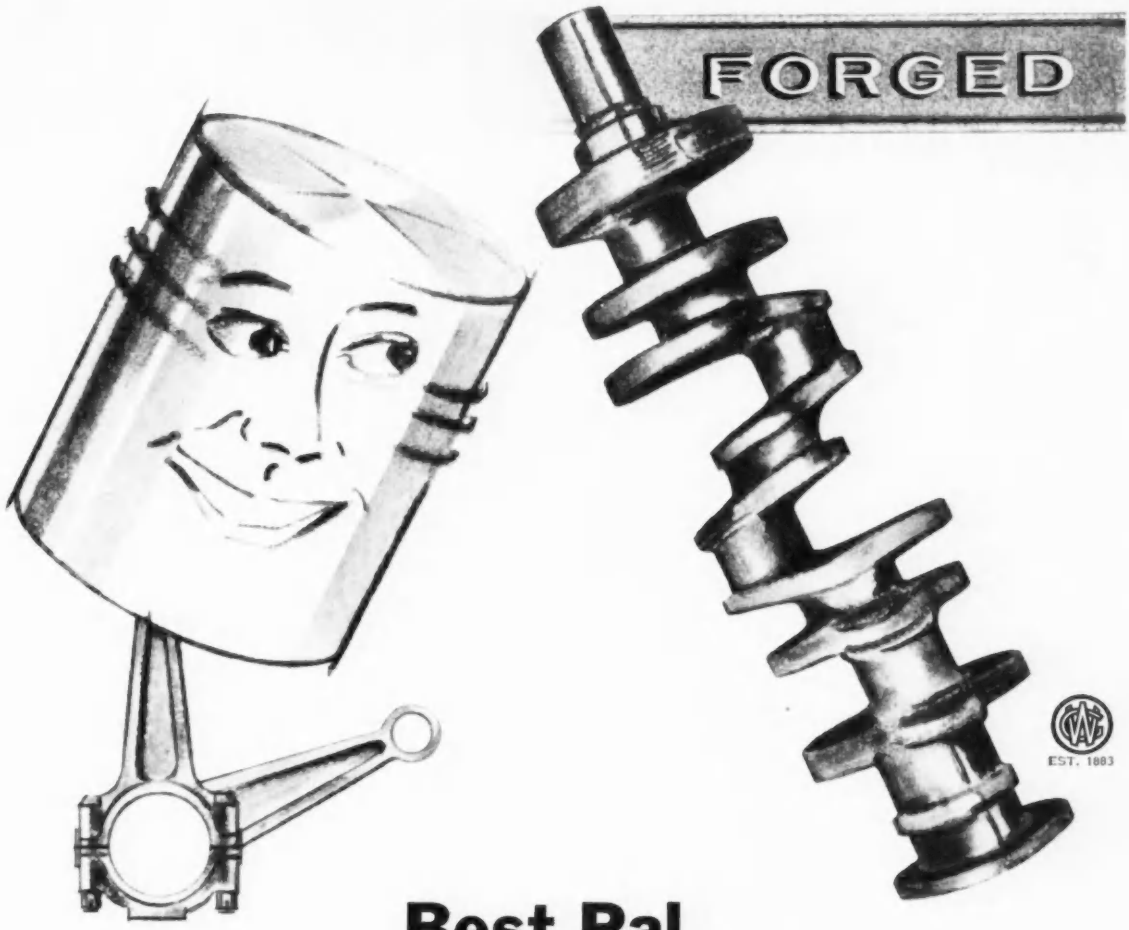
Necrology

Roy E. Hess, 66, retired executive at Transue & Williams Steel Forging Corp., died recently.

Charles H. Reynolds, 68, retired vice-president and former member of the board of directors of The Sheffield Corp., died Aug. 31, at Brutus, Mich.

Frederick S. Mallette, 53, executive secretary of the Air Pollution Controls Committee of the American Society of Mechanical Engineers, died Sept. 10, at Riverside, Conn.

Robert S. Reeves, 56, executive vice-president of Universal C.I.T. Credit Corp., died Aug. 21, at Yonkers, N. Y.



Best Pal
a Piston ever had

Crankshafts have been made successfully by other methods of fabrication and have proven good enough for certain non-critical applications—but for maximum dependability of the modern, compact, high-compression, high-torque, heavy-duty engine a forged crankshaft is essential.

In a crankshaft there is no substitute for a forging, and in a forging there is no substitute for Wyman-Gordon quality and experience.

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Aluminum , *Magnesium* *Steel* *Titanium* *Beryllium* *Molybdenum* *Columbium*

WORCESTER MASSACHUSETTS

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FORT WORTH TEXAS
FRANKLIN PARK ILLINOIS
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1959 Technical Report No. 4

Field Service...

safeguard to product reputation

Severe environmental conditions or abnormal operation of internal combustion engines will ultimately cause trouble...ranging from premature impairment of efficiency to complete breakdown.

When the user of the equipment doesn't really know the cause of trouble he should ask for and expect assistance in diagnosing the failure. If he doesn't get the information or help he needs he may simply condemn the product and let it go at that.

The attention of competent service engineers is needed in such cases, for without such attention no reputation for quality will survive. Ignoring more than momentarily such requests for information or help...or such complaints about the product...invites damaging criticism when *the man who has the problem talks about the product.*

In the handling of service problems arising from piston rings and related engine parts, the service engineering staff of Perfect Circle Corporation represents more accumulated field service experience than any other ring manufacturer.

This field service capability and availability is a plus value for our customers...and contributes greatly to our continuing research program by keeping us closely in touch with user experience in the field. We learn constantly how our products respond to extreme operating conditions, and how they can be improved to increase the use life of rings over other parts.

When you are confronted with problems involving piston rings or related engine components, we would be grateful for the opportunity to work with you in research, engineering, and field service.

PERFECT CIRCLE

PISTON RINGS **POWER SERVICE PRODUCTS**

Hagerstown, Indiana **In Canada: Don Mills, Ontario**

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Putting First Things First

an Editorial

OUT OF THE AVALANCHE OF PUBLICITY, news, interpretations and printed interviews which have been supplemented by reports of conferences and discussions of governmental, industrial, labor and other executives with Premier Khrushchev, a rather blurred over-all picture has been presented. Up to this time, most of such information has been economically uninformative with little, if any, presentation of the actual policies, plans and projects of Soviet Industry for comparison with American industry. It might well be appropriate, therefore, to clarify the total view by recapitulation of the major objectives of the plans of the U.S.S.R. which bring into focus their major industrial programs.

LAST JUNE, THE COMMUNIST PARTY'S Central Committee ordered a concentration of efforts upon industrial equipment modernization to increase productivity. This was the result of a five-day meeting at which Premier Khrushchev was the main speaker according to usually reliable reports. The Soviet expert on industrial efficiency told the sessions about his estimates of the deficiencies of Soviet production equipment and said that retooling for modernization purposes was too gigantic a task for fulfillment under the Seven-year Plan which ends in 1965. But to spur progress in the direction of improvement, a master plan was adopted which included the following steps:

(a) Introduction of widespread automation. Experts were assigned a task of spending six months to come up with a suitable program.

(b) General modernization of production machinery. Experts reported much of Soviet machinery was overdue for the scrap heap.

(c) Further streamlining of the scientific and technical educational program to eliminate technical manpower deficiencies in some areas.

AMERICA'S AUTOMOTIVE INDUSTRY is in no danger of being superseded by Russian production superiority. In each of the branches of automotive functions of manufacturing, design, purchasing, production, plant maintenance and tooling, the American automotive industry provides ample evidence of superiority and leadership. But it is nevertheless important for all engineers, designers and management men, production and purchasing experts and operations supervisors, to realize that it is the intent of our foreign competitors to improve productivity as rapidly as possible and to compete aggressively in production modernization. It will not be as easy to keep far ahead of any foreign manufacturing competitors in the future, as it has been in the past.

AMERICA'S LEADERSHIP IN PRODUCTIVITY has been its principal economic asset for several decades. The automotive industry has been in the vanguard of the manufacturing fields which have originated, developed and improved production advances which have made increased productivity possible here. By team-work with machine tool builders, materials handling equipment engineers and manufacturers, electronic and automation experts and producers, and other varieties of industrial and process engineers, spectacular advances have been possible in this country, and especially in the automotive industry.

TO KEEP THIS ECONOMIC ADVANTAGE, we must all renew our image of America's place as a leader in production engineering. That is much more important than what Premier Khrushchev thinks about super-markets or what he has learned about growing corn in Iowa. What Khrushchev has done at home is more important than what he did in San Francisco. His emphasis at home was upon catching up with America in production, machine tools and efficiency. It is our job, as managers, engineers and production experts, to make certain that every year American industries widen the gap more and more between America's basic advantage in high productivity and Russia's potential for equating this vital sinew of our domestic industrial strength which is the source of both peace and prosperity, as well as defense security for the American people.

Hartley W Barclay

Editor

(Advertisement)

III

KNOW YOUR ALLOY STEELS . . .
This is one of a series of advertisements dealing with basic facts about alloy steels. Though much of the information is elementary, we believe it will be of interest to many in this field, including men of broad experience who may find it useful to review fundamentals from time to time.

What Does Grain Size Mean In An Alloy Steel?

The grain size of alloy steels is generally understood to mean austenite or inherent grain size, as indicated by the McQuaid-Ehn carburizing test. Austenite grain size should be distinguished from ferrite grain size, which is the size of the grains in the as-rolled or as-forged condition with the exception of those steels that are austenitic at room temperature. When steel is heated through the critical range (approximately 1350 to 1600 deg F for most steels, depending on the composition), transformation to austenite takes place. The austenite grains are extremely small when first formed, but grow in size as the temperature above the critical range is increased, and, to a limited extent, as the time is increased. It is apparent, therefore, that both time and temperature must be constant in order to obtain reproducible results.

When temperatures are raised materially above the critical range, different steels show wide variations in grain size, depending on the chemical composition and the deoxidation practice used in making the heat. Heats are customarily deoxidized with aluminum, ferrosilicon, or a combination of deoxidizing elements. Steels using aluminum or other deoxidizers in carefully controlled amounts maintain a slow rate of grain growth at 1700 deg F, while heats finished with other deoxidizers, usually ferrosilicon, develop relatively large austenite grain size at temperatures somewhat below 1700 deg F.

The McQuaid-Ehn test is the one ordinarily used for determining grain size. Steel is rated with a set of eight ASTM charts that are compared one at a time with a specially prepared steel sample until one is found to match. Number 1 grain size, the coarsest, shows 1½ grains per sq in. of steel area examined at 100 diameters magnification. The finest chart is Number 8, which shows 96 or more grains per sq in. at the same magnification.

Properties Affected by Grain Size

Fine-grain steels (grain sizes 5, 6, 7, and 8) do not harden as deeply as coarse-grain steels, and they have less tendency to crack during heat-treatment. Fine-grain steels exhibit greater toughness and shock-resistance—properties that make them suitable for applications involving moving loads and high impact. Practically all alloy steels are produced with fine-grain structures.

Coarse-grain steels exhibit definite machining superiority. For this reason a few parts which are intricately machined are made to coarse-grain practice.

The correct specification and determination of grain structure in steel is a subject that has been given long study by Bethlehem metallurgists. If you would like suggestions on this or any other problem concerning alloy steels, these men will be glad to give you all possible help.

In addition to the entire range of AISI alloy steels, Bethlehem produces special-analysis steels and the full range of carbon grades.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
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BETHLEHEM STEEL

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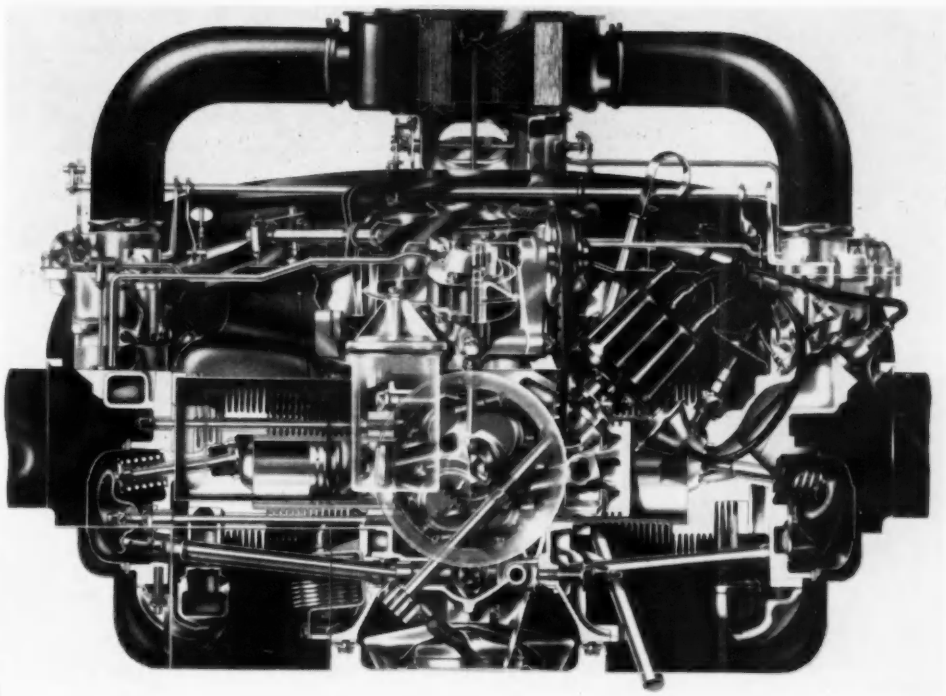


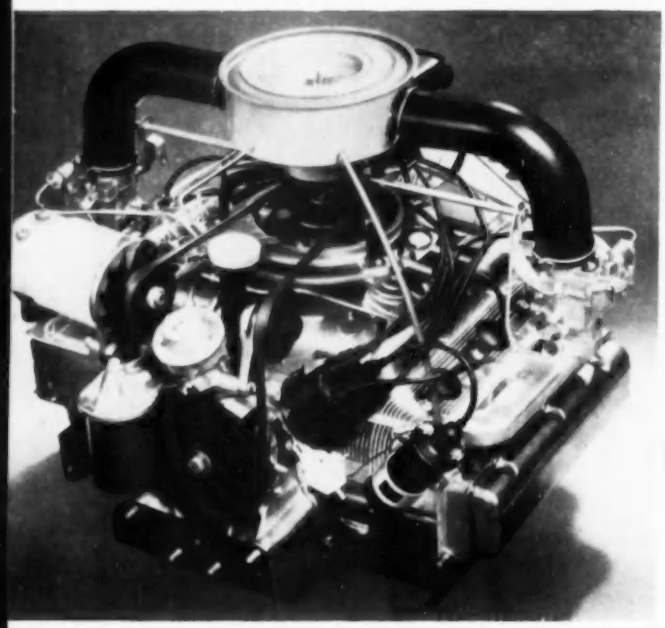
Transverse cross-section of Corvair 6-cylinder aircooled engine

The All-New Chevrolet Corvair

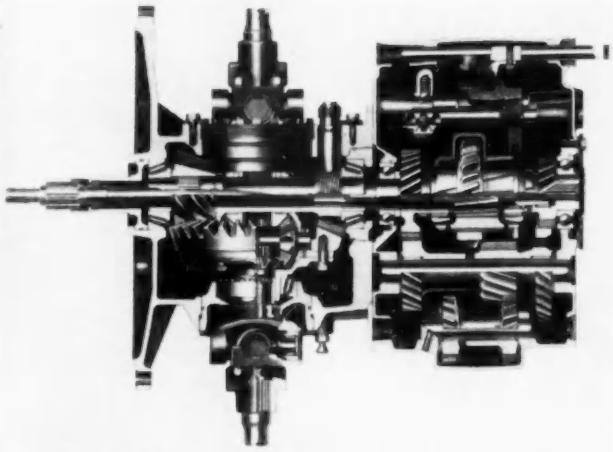
WITH its launching for the 1960 model year, the Chevrolet Corvair unquestionably represents a "first" in the design concept of an American mass-produced car. First of all it features a unitized type body dispensing with the usual chassis frame. It has wheelbase of 108-in.; front and rear tread of 54-in.; overall length of 180-in.; and is 66.9-in. wide. It comes in the form of a four door, 6-passenger model in standard and deluxe versions.

Looming larger than any other feature, however, is the long-awaited disclosure of the 140-cu-in., aircooled six-cylinder flat engine with aluminum structure, mounted in the rear. In this design, the power package is built as a unit with engine and transaxle, the entire package being integrated with its rear suspension. At assembly at Willow Run the entire running gear consists of the front suspension assembly and the rear powerplant assembly, the two assemblies being attached to the body structure at one station.

Weight distribution plays an important role in a rear engine vehicle and on the Corvair they have designed and positioned all components so as to have approximately 40 per cent of the weight at the front, 60 per cent at the rear. With this static weight distribution steering is said to be almost effortless without power assist; and braking is considered to be most favorable since braking effort tends to shift the weight to the front wheels. Under most braking conditions each wheel is said to do about equal work and brake linings take nearly equal wear. One of the major advantages of the Corvair, according to Chevrolet engineers, is that it handles uniformly at all loads.



Corvair engine and transmission assembly



Sectioned view of the transmission, differential and ring gear, etc.

In considering car handling characteristics, Chevrolet engineers cite two major factors that must be taken into account. To eliminate a tendency to wander, rear tires must not be overloaded. The other factor is the desired amount of understeer. This is accomplished by providing a sense of direction of rear wheels slightly better than of the front wheels.

Wander is controlled on the Corvair by using the new low profile Tyrex cord tires mounted on a wider rim. To effect understeer, Chevrolet specifies normal inflation pressure for rear tires, reduced inflation for front tires. This balance of tire pressures, supplemented with the geometry of the independent front and rear suspensions, effects the desired degree of understeer.

With the rear-mounted engine the passenger compartment tends to be inherently cooler. For winter driving Corvair provides as optional equipment a gasoline-fueled air-flow heater. Absence of the driveline and exhaust plumbing under the floor, coupled with the isolation of the power train and suspension systems through the use of rubber, makes the passenger compartment quieter as well.

ENGINE DETAILS

The Corvair engine is a 6-cylinder, horizontally-opposed type, aircooled engine. The major structural member — the aluminum alloy crankcase — is roughly rectangular in shape and is cast in two halves, bolted together at the vertical parting line. It has a relatively shallow stamped steel oilpan, and a rectangular cast aluminum crankcase cover. This comprises the main central structure, together with the rear housing, an aluminum alloy casting that contains the oil pump and primary oil passages. The latter also provides mounting for the distributor, fuel pump, oil fill pipe, and rear crankshaft oil seal.

Brief Specifications

1960 CORVAIR ENGINE

Six-cyl, Horizontal Aircooled

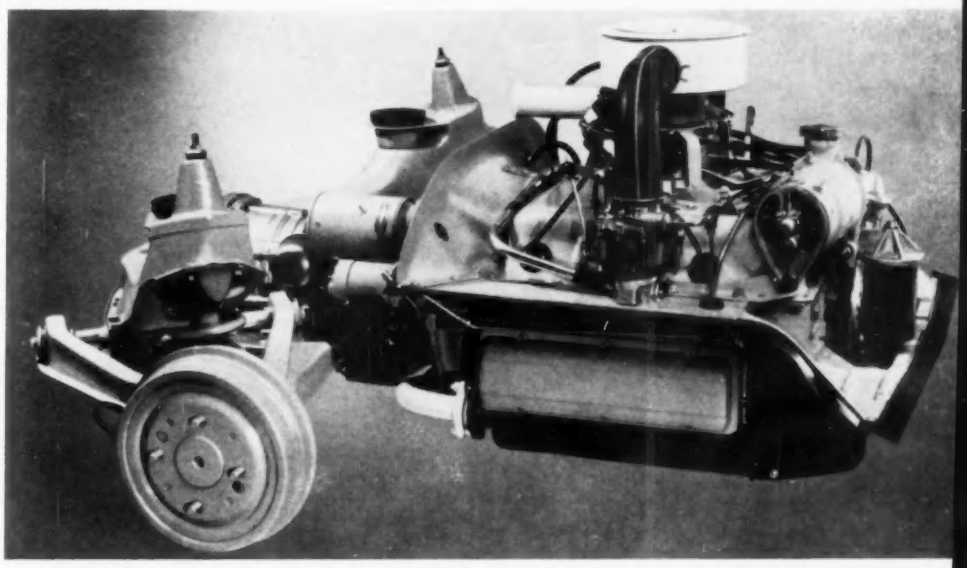
Bore (in.)	3.375
Stroke (in.)	2.60
Displacement (cu in.)	140
Compression Ratio	8 to 1
Bhp (max.)	80 @ 4400 rpm
Torque (lb ft) max.	125 @ 2400 rpm
Carburetor	Two, single-barrel down-draft type
No main Bearings	4

Individual cast iron cylinders are employed, each bank being secured in place by means of a cast aluminum cylinder head containing the three combustion chambers for its bank of cylinders. Cylinders and cylinder heads are provided with cast-in fins. Twelve long studs, four for each cylinder, extend from each cylinder head through to the crankcase for fastening.

The engine is mounted with the flywheel end to the front, direction of rotation being clockwise when viewed from the flywheel. Thus it becomes "backward" mounted by conventional standards and the cylinder numbering system is reversed. The right rear cylinder becomes No. 1; the left rear, No. 2. Firing order is 1-4-5-2-3-6.

Pistons are of conventional design: flat dome, aluminum alloy with a light tin-plate coating, with steel struts. Two compression rings and one single-piece oil control ring are employed. The piston pin is a press fit in the connecting rod.

The engine uses four steel-back-



Powerplant and rear-suspension assembly ready for installation at the rear of the body

ed babbitt main bearings of the familiar type in which there is a sintered copper-nickel matrix bonded to the steel back and coated with a thin overlay of lead babbitt. Major departure from the conventional is that the engine does not require separate main bearing caps. The bearing halves are fitted into semi-cylindrical bores in the crankcase halves and when the two halves are fastened together the bearing shells become right- and left-hand instead of upper and lower as is customary.

The forged steel crankshaft has six throws arranged in pairs. Each crankpin is at 180 deg from the other of a pair, the pairs being 60 deg apart. This arrangement is said to produce inherent balance without resort to counter-weights.

View showing detail of the front suspension system sub-assembly, ready to attach to the front end of the body

VALVE ARRANGEMENT

As illustrated, the valves are in the head and are actuated by push-rods, through stamped rocker arms similar to those used in Chevrolet V-8's. They are arranged in line with alternate intake and exhaust.

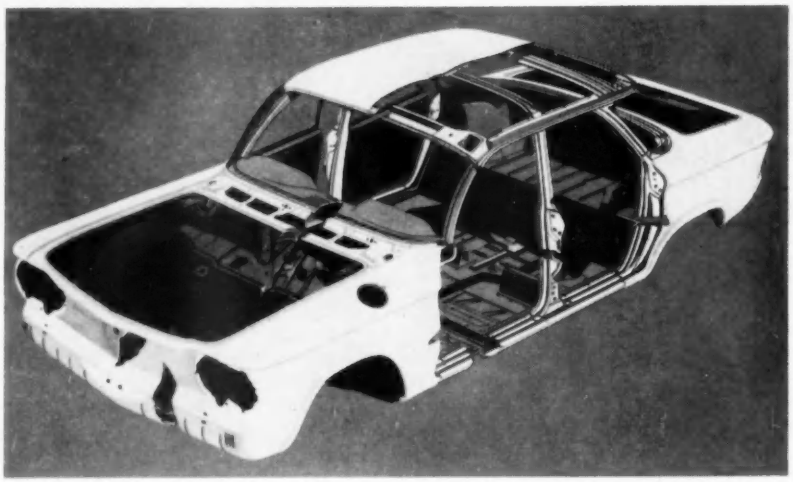
Centrally located below the crankshaft, the camshaft too, is unconventional, having only three exhaust valve lobes. These are wider than the intake valve lobes, enabling each lobe to actuate the push-rods for two exhaust valves.

Because of the absence of a cylinder block, push-rods are housed within steel tubes in the spaces between the crankcase and cylinder head. The tubes also serve as a drain for the return of lubricant from the head to the oilpan. Intake valve inserts are of cast nickel alloy steel, while exhaust valve inserts are of cast chromium steel alloy.

Combustion chambers are of modified wedge-shape, differing in geometry from those employed in Chevrolet V-8's. Spark plug position near the top of the chamber minimizes plug fouling, and makes the plugs accessible for servicing.

To provide for adequate cooling of the engine, the entire assembly is enclosed by a metal shroud that forms a plenum chamber. A centrifugal blower, mounted on a vertical shaft, on the top of the crank-

Four-door Chevrolet Corvair



The Corvair Unitized body

case cover, delivers cool air outward and downward over the cylinders and heads. An interesting feature of the blower is a special belt drive from a pulley on the extreme rear end of the crankshaft. Because of the geometry of the drive, the belt must change planes from vertical to horizontal between the crankshaft and blower pulleys. This change is effected by means of two pulleys rotating on transverse horizontal axes. One at the left also serves as the generator drive pulley; the other, at the right rear, is an idler. The latter, mounted on an adjustable arm, also provides a convenient means for adjusting belt tension. The generator is mounted transversely, both pulleys being mounted in ball bearings.

Returning to the cooling system, the air stream from the blower enters a duct under each bank, each duct leading backward to an opening at the rear of the engine. Above the cooling air discharge duct at the left is an oil cooler through which a portion of the cooling air passes before it is discharged. Rate of cooling is regulated by a bellows thermostat in the lower part of the plenum, operating a damper ring. This ring, similar to a tire rim in shape, closes the blower air intake until the engine has reached the correct operating temperature.

An unusual feature of the two-carburetor induction system is in the location of the choke. Instead of being located on the carburetors, the automatic choke mechanism operates on an air inlet pipe at the front of the air cleaner. Thus the flow of air during cold starts and warmup is regulated before it reaches the air cleaner. The air cleaner, fitted with an oil-wetted polyurethane element, is mounted on a tripod above the blower shroud and has two openings leading to large air tubes. These tubes, of fabric-reinforced rubber, lead to the two single-barrel carburetors. An intake manifold is cast integral with each cylinder head, thus making the induction system separate for each bank.

The lubricating oil pump body is an integral part of the aluminum rear engine housing. The drive gear of the conventional gear pump is fastened to a slotted shaft, driven by a mating tongue on the end of the distributor shaft. Pressure is limited to 35-psi by means of a spring-loaded regulator valve.

Lubricant enters a passage formed by cast hollows in the rear of the crankcase and front surface of rear housing and travels up to the top of the crankcase where it enters the oil filter, standard equipment of the Corvair. Then it passes through the oil cooler, enters another gallery formed by the crankcase and rear housing, thence to the main oil galleries which serve as hydraulic valve lifter galleries as well. The four main bearings and four camshaft bearings are supplied with oil at full system pressure. Oil is carried to connecting rod bearings through holes drilled in the crankshaft.

This engine does not require separate camshaft bearings, bearing bores being machined directly from the aluminum base metal.

Overspray from the front main bearing and front camshaft bearing lubricates the timing gears.

A thermostatic oil cooler by-pass valve contributes to rapid engine warmup, being in closed position when oil temperature is 160 F or higher. At lower temperatures the valve opens, permitting oil to by-pass the cooler.

The fuel pump is of straight pushrod type without a rocker arm, driven by an eccentric on the crankshaft. Since it is driven at engine

speed, it has a shorter stroke than is customary. The pump is mounted outside the engine shroud where it is relatively cool. It is provided with a new type molded diaphragm.

Carburetor design is noteworthy because the main nozzle cluster differs from the boost venturi type used conventionally. Instead of the ring-shaped end that forms a small boost venturi, the main nozzle terminates in a cluster of four small radial tubes. This has been found more effective for use with the relatively low gas velocities developed with dual carburetors on a small displacement engine.

The exhaust system consists of a single muffler mounted close to the engine on the right side. The forward ends of the exhaust manifolds are connected to the muffler by means of a common exhaust pipe, shaped like a modied Y. The muffler assembly has an integral tailpipe eight inches long. The muffler is of cylindrical reverse flow type, 6-in. in diameter, 20⅝-in. long. Proximity to the engine makes for longer life. Additional durability is imparted by an asbestos wrap over the steel double-wrap inner shell, covered by a single outside steel shell. The muffler is mounted to the engine on a single bracket, dispensing with flexible mounts.

Exhaust manifolds are straight cast iron pipes with three openings at the side, each manifold being attached to the cylinder head by three curved clamps.

The Corvair clutch is quite similar to the one used in Chevrolet cars with manual shift transmissions. The driven disk has an OD of 9⅛-in. with 72-sq in. of molded asbestos facing area. The 18-finger diaphragm spring provides a load of 975 lb. No damper springs are required since crankshaft torsional vibrations are largely absorbed by the flexible design of the flywheel.

Corvair employs the standard 12-volt system and has four sealed beam headlamps, 5¾-in. in diameter. Electrically-driven single-speed windshield wipers are standard.

TRANSAXLE ASSEMBLY

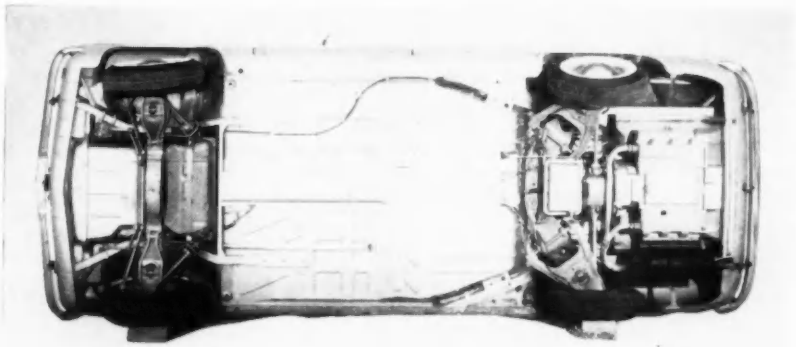
Another noteworthy component of uncommon design is the "transaxle" assembly. The standard package, to be described immediately, employs the standard equipment three-speed manual shift transmission. A special automatic drive, designed uniquely for Corvair and offered as optional equipment will be described later.

The manual shift transmission represents a notable departure from the conventional, although many of the components are similar to those in the Chevrolet transmission. Among its distinctive features are: use of an aluminum case; mounting directly to the differential carrier; and the fact that the input and output shafts are concentric.

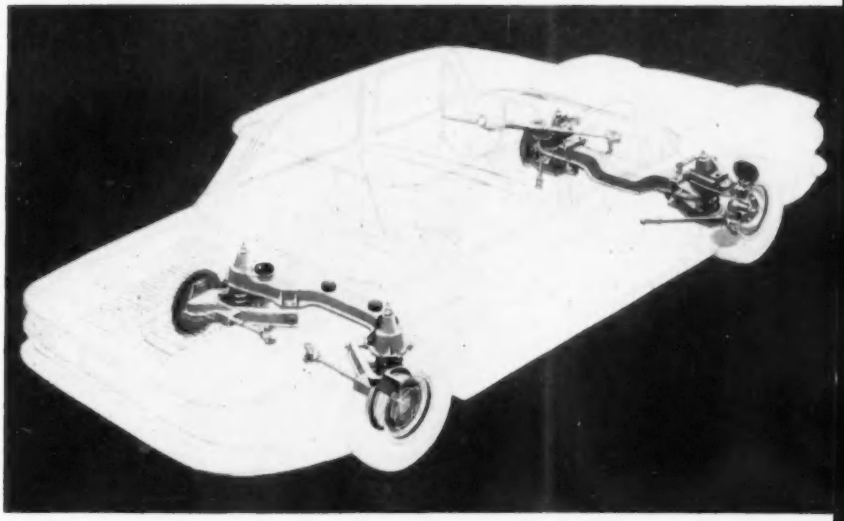
Gears are the same as in the Chevrolet transmission except for a change that effects the following ratios: 3.22 to 1 in first; 1.84 to 1 in second; direct in third; 3.65 to 1 in reverse. With its aluminum case this transmission, less linkage, weighs about 30 lb.

One of the most distinctive elements of the drive is the special axle with the differential between the engine and transmission. It is extremely compact, with straddle-mounted, high offset hypoid final drive gears. The hypoid pinion shaft is hollow, runs from front to rear of the case, and is mounted on large tapered roller bearings at

(*Turn to page 70, please*)



Underside of Corvair showing detail at the front end and engine mounting at rear



Phantom view of Corvair showing the front and rear suspension components

Ford Galaxie Town Victoria

NEW FORDS are Wider and Lower

ENTIRELY new bodies and fresh styling are major features of the 1960 Ford cars which are available in 15 models. All cars are mounted on the same 119-in. wheelbase chassis with front tread increased to 61 in., rear to 60 in. Overall roof height has been reduced to 55 in. Shoulder room has been increased three inches in front, four inches in the rear seat.

One of the distinctive features of the new bodies is in the elimination of the dogleg at the entrance. This was accomplished by moving the windshield corner post about 10 in. forward. Glass area has been increased by 17 per cent in the windshield, 63 per cent in the back light.

For 1960 Ford offers a line of four powerplants—the Six and three V-8's as outlined in the table. Features common to all engines include: wedge-shaped, high turbulence combustion chambers; free-turning overhead intake and exhaust valves; high-alloy cast steel exhaust valves; aluminum alloy pistons with chrome-plated top ring; full-flow oil filter; 18-mm spark plugs; cross-flow, pressure type cooling system with 180-deg positive-action thermostat; weatherproof ignition system; resistor-type high tension spark plug leads; aluminized mufflers.

The 223 cu in. OHV six-cylinder engine has the intake manifold modified with a one-inch lower carburetor riser for hood clearance. It also includes a rotor type oil pump, running change during the 1959 model year. This engine is fitted with a single, plain venturi Holley carburetor with an adjustable stroke accelerator pump and manual choke. An externally-

Ford Fairlane Tudor sedan

mounted, air-type dash pot is included with automatic transmissions. It also incorporates a vacuum control system for regulating ignition timing through the distributor without centrifugal advance. In addition, the fuel metering system has been recalibrated.

The 292-cu in. V-8 has been treated to many detail improvements. One of the major changes is the recontoured wedge-shaped combustion chamber with spark plug electrodes set deeper into the chamber. Smaller diameter intake valves are employed to provide better fuel economy. A new type of crankshaft vibration damper with pulley groove machined in the inertia member is a feature on all V-8's. A larger air filter with a new pleated cellulose element is used, with a shallower body to provide hood clearance.

The 332-cu in. engine used last year has been eliminated. For 1960 Ford employs a 352-cu in. engine in two versions — two-barrel and four-barrel carburetors. Chief differences between the two versions lie in the following items: intake manifold; camshaft; lower compression ratio for the 2-V version; and different timing.

The 4-V version of the 352-cu in. engine remains unchanged except for the features outlined here in connection with general engine improvements. One change, exclusive with this version, is a new quiet-contoured high-lift camshaft designed for better low-speed torque characteristics. The dual exhaust system for this engine has aluminized cylindrical-shaped mufflers, located at the rear.

Among the carburetor changes developed for the four-barrel version are hot air source relocated from the intake manifold to the right-hand exhaust manifold for choke operation, materials changed at critical points to increase corrosion resistance, and fuel metering changed to improve fuel economy.

All carburetors for V-8 engines have a new automatic choke which may be described as of air-valve, thermostatically-controlled type, utilizing a solid choke plate.

Improvements have been effected in the electrical system. ARK-LES blade type terminals now are used for both the ignition switch and headlight switch; nylon wiring clips are employed throughout; and multiple-gang connectors are used in the wiring harness circuits. The distributor has a unique feature, the breaker assembly being arranged to ride on three nylon buttons which require no lubrication and provide friction-free long-lived operation. Another feature is a sealed, theft-retardent ignition switch.

All Ford engines have a new en-

(*Turn to page* 46, *please*)

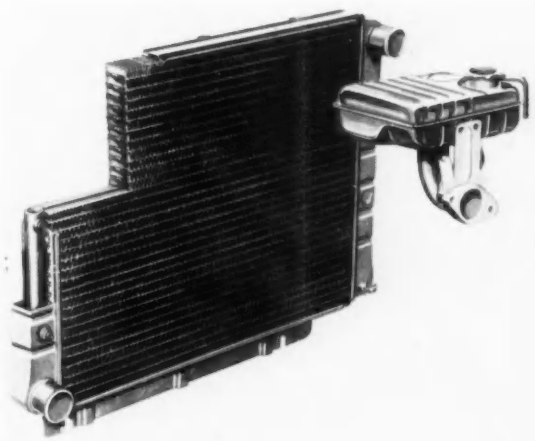
BRIEF MECHANICAL SPECIFICATIONS
1960 FORD ENGINES

Overhead Valve Type

Model	223	292	352-2V	352-4V
Type	6-cyl	90-deg V-8	90-deg V-8	
Bore (in.)	3.62	3.75	4.00	
Stroke (in.)	3.60	3.30	3.50	
Displacement (cu in.)	223	292	352	
Compression Ratio	8.4	8.8	8.9	9.6
Bhp (max.)	145 @ 4000	185 @ 4200	235 @ 4400	300 @ 4600
Torque (lb ft) Max.	—	—	—	—
Carburetor	Single	Two-barrel	Two-barrel	4-barrel
Fuel	Regular	Regular	Regular	Premium

1960 FORD MODELS

	Greenhouse Type
Fairlane Series	
Two-door Sedan	Basic Greenhouse
Four-door Sedan	Basic Greenhouse
Two-door Business Coupe	Basic Greenhouse
Fairlane "500" Series	
Two-door Sedan	Basic Greenhouse
Four-door Sedan	Basic Greenhouse
Galaxie Series	
Two-door Sedan	Greenhouse
Four-door Sedan	Greenhouse
Four-door Victoria	Greenhouse
Special Series	
Starliner (Two-door Victoria)	Unique Fast-back Greenhouse
Sunliner Convertible	Convertible Soft Top
Station Wagon Series	
Two-door Ranch Wagon (6-pass.)	
Four-door Ranch Wagon (6-Pass.)	
Four-door Country Sedan (9-Pass.	
Four-door Country Sedan (6-Pass.)	
Four-door Country Squire (9-Pass.)	



Details of cross-flow radiator and overflow tank on Ford V-8 chassis

Chevrolet Bel Air Sport Coupe

Chevrolet Passenger Cars for 1960

CHEVROLET for 1960 offers some major appearance changes as well as noteworthy revisions of the body structure to improve passenger comfort and vehicle utility. While the mechanical components remain substantially the same, numerous changes and refinements have been effected in the interest of longer life, improved performance, and better economy.

Starting with the body, it may be noted that the front compartment tunnel has been reduced—lower by 1¼-in., narrower by 1½-in. In the luggage compartment loading height has been lowered by some 1½-in., the spare tire and wheel being laid flat on the floor to eliminate the well.

All models except hardtops and convertibles have a straight slope windshield and solid safety plate glass in side windows.

The engine program has been carried out in the interest of improving economy. Fuel injection is no longer offered for passenger car models. When teamed with manual shift transmissions, all engines in the line are equipped with diaphragm type spring clutches having the same setup as in 1959.

The basic 283-cu in. now comes as an economy V-8 with a two-barrel carburetor. Following the pattern of the Six, the V-8 has been equipped with a low-lift camshaft, reducing valve lift and improving fuel economy thereby. Another advantage is an improvement in low and mid-speed engine performance. Although valve opening duration remains the same, the lower lift produces decreased effective valve overlap, thereby improving scavenging and promoting a cleaner fuel-air charge. Idling becomes smoother and quieter as well as more economical. The carburetor also has been recalibrated for greater fuel economy.

Conservation of engine oil is effected by the addition of a trough cast along the outer edge of each cylinder head. Oil is prevented from accumulating in the valve spring seat pockets, assuring rapid and sure drainage. In addition the outer rocker cover rail is lowered. Consequently, the cylinder head is new and not interchangeable with those used last year.

Durability of the camshaft and valve train is improved by the decrease in lift since accelerations and

1960 CHEVROLET
Model Identification Chart

SERIES	DESCRIPTION
Biscayne	2-Door Sedan, 6-Passenger
	Utility Sedan, 3-Passenger
	4-Door Sedan, 6-Passenger
Bel Air	2-Door Sedan, 6-Passenger
	4-Door Sedan, 6-Passenger
	2-Door Sport Coupe, 5-Passenger
	4-Door Sport Sedan, 6-Passenger
Impala	4-Door Sedan, 6-Passenger
	2-Door Sport Coupe, 5-Passenger
	4-Door Sport Sedan, 6-Passenger
	Convertible, 5-Passenger
Station Wagon	2-Door, 6-Passenger (Brookwood)
	4-Door, 6-Passenger (Brookwood)
	4-Door, 6-Passenger (Parkwood)
	4-Door, 9-Passenger (Kingswood)
	4-Door, 6-Passenger (Nomad)

stresses have been reduced. Because of the lighter demand, intake valves now are made of carbon steel instead of alloy steel; exhaust valves are no longer aluminized; and the harmonic balancer has been eliminated.

Another now feature is the adoption of an air cleaner with a polyurethane element. Regular grade gasoline is used and further economy is effected in cars equipped with this 283-cu in. engine by a reduction in rear axle ratios. When equipped with Powerglide the axle ratio is 3.08 to 1: with manual shift transmission or Turboglide, the ratio is 3.36 to 1.

Besides the Six and the revised 283 V-8, Chevrolet again offers optional engines as follows: 283-cu in. with four-barrel carburetor; the 348-cu in. V-8 with four-barrel or triple, two-barrel carburetors, as well as the regular and special camshaft versions. These options are the same as last year.

On the 283-cu in. V-8 with four-barrel carburetor the cylinder heads are revised in the same way as for the standard engine. Moreover, the same new rear axle ratios apply.

The line-up of 348-cu in. V-8's, which remains unchanged, includes five different options: two regular camshaft engines available with either four-barrel or triple two-barrel carburetion; plus three special camshaft options. One of these, with four-barrel carburetion is used with the heavy-duty Powerglide; the other two versions four-barrel or triple two-barrel—are available with either three-speed or four-speed manual shift transmissions. Added feature of the three special camshaft engines, described above, is the introduction of a 35-amp generator.

Additionally, the cast iron intake manifold of the Powerglide 348-cu in. Special has been improved by modifying the branches to effect better mixture distribution. The 348-cu in. engine with 4-barrel carburetor when used with a manual shift transmission continues to use the aluminum intake manifold. Both of the special 348 engines with manual shift transmissions have exhaust valves with hardened tips similar to the truck version.

Mufflers of improved construction and more corrosion-resistant are supplied with V-8 engines. Both inner and outer wraps are zinc-coated, the outer wrap being tucked into beads around the heads for a more durable joint. Heads are aluminum coated; end baffles and exit tube are zinc coated. In dual exhaust systems the inner and outer wrap are separated by a sheet of asbestos.

Apart from the refinements in the optional four-speed transmission, all regular equipment and optional transmissions are continued without change.

Clutch linkage has been improved to remove the effect of engine movement on the clutch pedal. To this end the clutch lever shaft has been lengthened and pedal lever movement further reduced by attachment to the shaft at the pivot point on the ball stud.

Service and parking brake systems have been redesigned to make operation easier. The service brake system requires less pedal pressure and has better distribution of effort between front and rear brakes, this being accomplished by increasing the inside diameter of front wheel cylinders by 1/16-in. Brake effort is further reduced by new brake shoe return springs.

Durability of rear axles has been increased by moving the "O" ring seal farther outboard, protecting a greater area around wheel bearings from corrosion. (*Turn to page 78, please*)

ADVERTISED ENGINE RATINGS
1960 Chevrolet Passenger Car

ENGINE	C. R.	GROSS HP-RPM	GROSS TORQUE-RPM	NET HP-RPM	NET TORQUE-RPM
235—In-line 6-Cylinder	8.25	135 @ 4000	217 @ 20 2400	*115 @ 3600	197 @ 12 2000
235—Economy Carb	8.25	110 @ 3200	210 @ 1600	*95 @ 3200	190 @ 1600
283—V8 2-Bbl	8.5	170 @ 4200	275 @ 2200	*135 @ 4000	245 @ 2000
283—V8 4-Bbl	9.5	230 @ 4800	300 @ 3000	*175 @ 4400	255 @ 2800
348—V8 4-Bbl	9.5	250 @ 4400	355 @ 2800	**210 @ 4400	320 @ 2600
348—V8 4-Bbl Spec Cam (Powerglide)	11.0	305 @ 5600	350 @ 3600		
348—V8 4-Bbl Spec Cam (Manual)	11.25	320 @ 5600	358 @ 3600		
348—V8 3x2-Bbl	9.5	280 @ 4800	355 @ 3200	**235 @ 4800	320 @ 2800
348—V8 3x2-Bbl Spec Cam	11.25	335 @ 5800	362 @ 3600		

* Single exhaust system.
** Dual exhaust system.

POWER TRAINS
1960 Chevrolet Passenger Cars

Base Equipment

ENGINE Type	Disp.	CARBURETION	TRANSMISSION	AXLE RATIO
6-cyl.	235.5	1-Barrel	3-Speed	3.55
			Overdrive	3.70
			Powerglide	3.36
V-8	283	2-Barrel	3-Speed	3.36
			Overdrive	3.70
			Powerglide	3.08**
			Turboglide	3.36

Optional Equipment

V-8	283	4-Barrel	3-Speed	3.36
			Overdrive	3.70
			Powerglide	3.08**
			Turboglide	3.36
	348	4-Barrel	3-Speed	3.36
			4-Speed	3.55
			Powerglide	3.08
			Turboglide	3.08
		4-Barrel and Special Camshaft	3-Speed	3.55
			4-Speed	3.55
			Powerglide*	3.55
		3 x 2-Barrel	3-Speed	3.36
			4-Speed	3.55
			Powerglide	3.08
			Turboglide	3.08
		3 x 2-Barrel and Special Camshaft	3-Speed	3.55
			4-Speed	3.55

* Heavy-Duty type.

** Cars equipped with FOA Air Conditioning use 3.36 axle with Powerglide transmission.

One of the 1960 tilt-cab models which are available in a line of medium, heavy, and extra-heavy versions

Ford's New Trucks Range Up to 51,000 lb GVW

FORD'S 1960 truck line covers more than 480 models ranging in gross vehicle weight from 4600 to 51,000 lb, with gross combination weights up to 76,000 lb.

Available in more than 200 models in six series, the light and medium trucks range in gross vehicle weight ratings from 4600 to 21,000 lb.

A choice of pickup bodies in 6½, 8 and 9 ft lengths with capacities up to 80 cu ft is offered in the light-duty models. A locking-type differential is available on the F-100 and F-250 light-duty trucks.

Both the 223 cu in. six cylinder engine and the 292 cu in. engine, together with a wide range of transmissions and axles, also are offered on the light-duty vehicles.

Typical of the new engineering advancements in Ford's medium truck line is the 1960 F-600. This vehicle offers a choice of 17,000, 18,000, 19,500 or 21,000 lb gross vehicle ratings. Standard F-600 frames feature new, stronger construction with more rugged rear spring brackets. Also, for the optional 21,000 lb GVW package, a new heavy-duty frame with 40 per cent greater modulus is provided.

The new heavy and extra duty truck line includes more than 200 conventional, tilt-cab and tandem models with maximum gross vehicle weights ranging from 22,000 to 51,000 lb and gross combination weight for tractor trailer applications from 35,000 to 75,000 lb.

In the heavy and extra heavy conventional models, F-700 through F-1100 series, the additional application of three new front axles and six rear axles, in either single speed or two-speed versions, provides added model versatility. Maximum GVW ratings also are increased from 2000 to 3000 lb over comparable 1959 models on virtually all models.

Engine applications on the conventional heavy-duty trucks have been increased from eight to eleven. Ford's 477 cu in. super-duty engine, formerly available on 1000 series models, is now optional on the 950 series and is also available on 1100 series trucks. The 354 cu in. super-duty engine is also available as optional equipment on the 1000 series trucks.

The heavy and extra heavy-duty tilt-cab series also offers additional axle selections. Availability of six added optional rear axles affords increased gross vehicle weight ratings of 1000 to 3000 lb. New tilt-cab tandem models are supplied on special order with gross vehicle weights from 37,000 to 51,000 lb.

Also available with GVW ratings to 51,000 lb are five conventional model tandem trucks. Additional axle options on the conventional tandem models include three new front and rear axle suspensions.

For use with the super-duty engines, an electric fuel pump is located in the fuel tank.

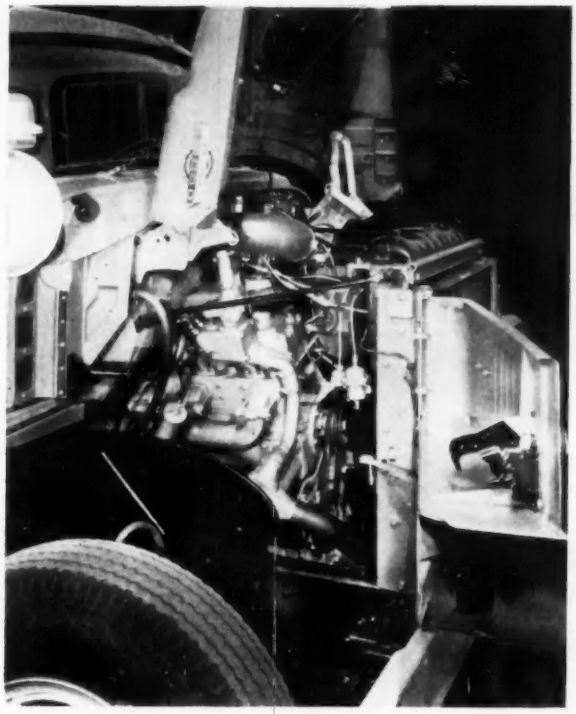
A new depth-type oil filter assembly, providing at least 20 per cent increase in filter efficiency, has been added to the 1960 six-cylinder engine.

All seven of the V-8 engines have new oil pump release valves, improved oil pump drive shafts, new crank shaft knurlings, improved oil control rings, and new piston rings. ■

Three SAE Meetings

Three national SAE meetings will be held Oct. 26-30 in Chicago. Technical sessions on Transportation and Maintenance, Diesel Engine and Fuels and Lubricants will cover topics including balancing of drive mechanisms, automatic transmission fluids, crankcase oils and Diesel noise.

Dodge Introduces New Series of Trucks



Swinging out the right front fender exposes filler pipes and dipsticks; heater hoses and connections; radiator shutter operating mechanism; air cleaner connections; and Nos. 1 and 2 cylinders.

A NEW series of medium and high-tonnage gasoline and Diesel trucks, featuring swing-out fenders that provide fast and convenient engine accessibility, highlights the 1960 line of Dodge trucks.

Gross vehicle weights are increased up to 53,000 lb and gross combination weights up to 76,800 lb.

One hundred and forty basic models will be offered in the new line, which includes conventional, cab-forward, 4-wheel-drive, forward-control, school bus chassis, and tandem units. Eleven gasoline engines will be available, with a horsepower range from 113 to 228, and four Diesel engines, with a horsepower range from 175 to 220, will be offered.

Featuring a BBC dimension of only 89¾ in., the new cab-forward units enable truck operators to pull 35-ft trailers in states permitting a 45-ft over-all length, and 40-ft trailers in 50-ft states. To make legal payloads higher in states using the "bridge formula," the front axle is only 28 in. from the front of the bumper.

Front fenders on the new cab-forward models swing out 110 deg at the release of a single latch to provide instantaneous access to the engine and its accessories. Hinged at the radiator, the swung-out fenders expose headlamps, horns, belt drives, wiring, and other components for servicing and maintenance. In addition, an alligator-type hood opens 90 deg vertically, ensuring easy access for servicing many components in the engine compartment.

Three new gasoline engines with displacements of 361 cu in. and horsepower ratings of 178, 194, and 204 are available. Two 413-cu in. V-8 engines are being introduced with horsepower ratings of 217 and 228. The new engines have such features as solium-cooled Stellite-faced exhaust valves, and water-heated intake manifolds.

Four Cummins Diesel engines for high-tonnage trucks are available. These are: The Turbo-

(*Turn to page 72, please*)

Cab-forward Dodge Diesel. This NCT1000 model offers a maximum GVW rating of 53,000 lb, and a maximum GCW rating of 76,800 lb.

Dodge Dart four-door hardtop

Dodge Dart Offers 20 Models

ACCORDING to Dodge Division, banner news this year will be "Big Four," with introduction of Dodge Dart—intended to compete with the present Big Three in every respect. Available in three Series: Seneca, Pioneer, and Phoenix, the line will be offered in 20 models. Passenger cars have a wheelbase of 118-in., station wagons—122 in.

All three series will have a four-door sedan. Station wagons and club sedans are offered in Seneca and Pioneer Series; the two-door hardtop is available in the Pioneer and Phoenix Series; and a convertible and 4-door hardtop in the Phoenix series.

From the standpoint of mechanical features the Dart will offer many of the details outlined in the general article on Chrysler Corp. (see AI, Sept. 15, 1959). The new OHV 6-cylinder engine as well as the 318-cu in. V-8 engine are offered on Seneca and Pioneer models. The 318-cu in. engine with four-barrel carburetor is standard on Phoenix models. In addition, Phoenix models can be fitted with the D-500 ram-induction package as optional equipment. Further data appears in the above tabulation.

DODGE DART ENGINE DATA—OHV ENGINES

Model	Seneca 6 Pioneer 6	Seneca V-8 Pioneer V-8	Phoenix	Phoenix D-500 Package
Type	6-cyl.	90-deg. V-8		90-deg. V-8
Bore (in.)	3.40	3.91		4.25
Stroke (in.)	4.125	3.31		3.38
Displacement (cu in.)	225	318		383
Compression Ratio (to 1)	8.5	9		10
Bhp (max)	145 @ 4000	230 @ 4400	255 @ 4400	310 @ 4800
Torque (lb ft) max.	215 @ 2800	340 @ 2400	345 @ 2800	435 @ 2800
Induction System	1-bbl Carb.	2-bbl Carb.	4-bbl Carb.	Ram Induct. Two, 4-bbl

The three-speed manual shift transmission is standard on all models. Both Powerflite and Torqueflite automatic transmissions are available as optional equipment with V-8 engines. In addition, the new small three-speed transmission, described earlier, is available as an option with the OHV Six. Torqueflite is standard with D-500 power package.

Dart models all have the Chrysler unit-type body with optional automatic swivel seats, and optional six-way power seats. In addition, most models will have a higher seat back on the driver side. Safety features, described previously, include optional vacuum-operated door locks; deep-dish, four-spoke steering wheel available with automatic transmission; padded dashboards; and full width sun visors.

Station wagons, offered in six- and nine-passenger versions, have two new accessory items: a chrome contour roof luggage rack, and chrome assist handles. These wagons feature a positive latch on the second seat and an exclusive tail gate safety latch. The third seat is of rear-facing type. Dual air conditioning is available as an option.

Standard brakes are 11.5 x 2-in. on all passenger cars; 11.5 x 2.5-in. front and 11.5 x 2-in. rear on station wagons, while 11.5 x 2.5-in. brakes are installed in all cars employing the optional D-500 power package. ■

Ventura Series Added to Pontiac Line for '60

Pontiac Catalina four-door sedan

ALTHOUGH Pontiac launched its cars last year with a dramatic change in styling, the 1960 line has been retailored completely as to exterior sheet metal and line and contour.

For 1960, Pontiac has four series in 16 models as follows: CATALINA —2-dr. and 4-dr. sedans; 2-dr. and 4-dr. hardtops; convertible; and 6-pass. and 9-pass. four-door Safari models. VENTURA series consists of a 2-dr. and 4-dr. hardtop. STAR CHIEF — 2-dr. and 4-dr. sedans; and a 4-dr. hardtop. BONNEVILLE—2-dr. and 4-dr. hardtops; custom convertible; custom Safari. The Ventura series is new this year.

Catalina and Ventura series as well as the Bonneville Safari are mounted on a 122-in. wheelbase chassis; the Star Chief and the other Bonneville models are on a 124-in. wheelbase chassis.

The engine setup this year requires a detailed explanation due to the variety of standard equipment engines and special options. First of all, there are two standard engines using regular fuel supplied with the standard manual shift transmission. For Catalina, Ventura, and Star Chief the standard engine features a 1¼-in. two-barrel carburetor and has a compression ratio of 8.6 to 1. Bonneville employs the same engine except that

(*Turn to page* 69, *please*)

1960 PONTIAC LINE—AVAILABILITY OF ENGINE VERSIONS

Basic 90-deg V-8 OHV 389 cu in. displacement

Designation	Standard		Optional		Economy	Power Special
	A	B	C	D		
Compression ratio	8.6		10.25		8.6	10.75
Bhp (max.)	215 @ 3600	281 @ 4400	283 @ 4400	303 @ 4600	215 @ 3600	318 @ 4600
Torque (lb ft) max.	390 @ 2000	407 @ 2800	413 @ 2800	425 @ 2800	390 @ 2000	430 @ 3200
Carburetor	1¼-in. 2-bbl	4-bbl	1½-in. 2-bbl	4-bbl	1¼-in. 2-bbl	Three, 2-bbl
Transmission	Synchromesh		Hydramatic Only		Hydramatic Only	Synchromesh or Hydramatic
Fuel	Regular		Premium		Regular	Premium

Special Notes: Standard A—Catalina, Ventura, Star Chief only.
Standard B—Bonneville.
Optional C—Catalina, Ventura, Star Chief only.
Optional D—All Series.
Economy—All Series with Hydramatic only, has high efficiency camshaft. Rear axle ratio 2.87 to 1 for Bonneville; 2.69 to 1 for all other Series.
Power Special—All Series.

1960 Thunderbird hardtop model

The 1960 *THUNDERBIRD*

THE 1960 Thunderbird has had several important changes made which will add to driver and passenger comfort. Also, some modifications have been made in exterior styling.

A sliding roof panel will be offered with the hardtop model as a factory option. Located over the front seats, it is opened and closed on tracks and is controlled manually with a chrome ring-bolt. A spoiler bar is attached to the windshield header so that air flow will not enter the car and so that a partial vacuum is created just over the sliding panel. This allows the panel to be opened and closed easily and also permits good ventilation and air circulation in the entire car.

The convertible soft top is now fully automatic. When the lead clamps have been released and the top control handle pulled, the rear deck will open automatically, the top will fold down into the trunk, the deck lid extension panel will swing into place and the deck lid will return to its closed position. The stops will follow in reverse when the top is put up again.

The grille, front fender ornaments, side spear mouldings and tail-lights have been changed to present a modified exterior appearance. There are six rear lamps in place of four, two serving as back-up lights. ■

New Fords, Wider and Lower

(*Continued from page* 39)

gine rear mount of rubber, integral with the third cross-member.

The chassis frame is of ladder type construction 11.8 in. longer than last year, wider at several points. The convertible has a heavy X-member of I-beam section added to the frame.

Steering gear is of recirculating ball and nut type. For power steering Ford employs a linkage type assist mechanism. Front suspension has upper support arms mounted in threaded bushings, lubricated for life. A link type roll stabilizer is used at the front.

Rear springs are of four-leaf design, 60 in. long and 2.5 in. wide. They have variable rate by virtue of a short front section. Rubber insulating bushings are applied at the front spring eye and in the shackle. Rear springs are outboard mounted and have a tension shackle at the rear.

Ford offers two automatic transmissions as optional equipment. The two-speed Fordomatic has been refined in detail through changes in calibration, a revised shift pattern, and changes in pressure regulator valve and converter stall speed.

The Cruise-O-Matic (dual range) transmission is available as an option on the two versions of the 352-cu in. engine. Here too some detail changes have been made for 1960. Diameter of the torque converter has been reduced from 12 5/16 in. to 12 in. while torque multiplication has been upped to 2.1 to 1; and converter stall speed increased about 200 rpm.

Returning to the new bodies, it is of interest that front fenders are narrow-width, removable bolt-on design. The trunk compartment has been changed in geometry, the spare tire being housed on the right-hand side, back of the wheel housing without resorting to a tire well.

The grille is of anodized aluminum of heavier gage than last year. All ornamentation below the belt line is either aluminum or stainless steel, except the nameplates and parking lamp bezels which are chromium-plated zinc die castings. ■

Dodge Brings Out Matador and Polara Models

1960 DODGE ENGINE DATA
90-deg. OHV V-8

Model	Matador	Polara	D-500 Power Package
Displacement (cu in.)	361	383	383
Compression Ratio	10 to 1	10 to 1	10 to 1
Bhp (max)	295 @ 4600	325 @ 4600	330 @ 4800
Torque (lb ft) max.	390 @ 2400	425 @ 2800	460 @ 2800
Induction System	2-bbl carb.	4-bbl carb.	Ram induction two, 4-bbl

FOR 1960 Dodge offers two entirely new cars, new in design and styling and with new name plates. These are the Matador and Polara, offered in 11 models, including six- and nine-passenger station wagons. Mounted on 122-in. wheelbase, both series of the line include the following models: two-door hardtops; 4-door sedans; 4-door hardtops; and the six- and nine-passenger station wagons. In addition, Polara features a convertible as well as station wagons with hardtop styling.

The Dodge line features the unit-type body with optional automatic swivel seats and thicker optional 6-way power seats. In general, the major mechanical features, engine details, and other items follow the pattern described in the article on Chrysler Corp., features (see AI, Sept. 15, 1959).

As shown on the engine data tabulation, the 361-cu in. V-8 engine is standard on Matador; while the 383-cu in. V-8 engine with four-barrel carburetor is standard on Polara. In addition, the D-500 power package with ram-induction is available as optional equipment on both series. This option also includes the Torqueflite automatic transmission.

For the power train Dodge has the new heavy-duty three-speed manual transmission standard on Polara, while the more compact and lighter manual transmission is standard on Matador. Both Powerflite and Torqueflite automatic drives are available on Matador as optional equipment.

Among the safety features found on Dodge are: optional vacuum-operated door locks; deep-dish steering wheel standard when an automatic transmission is specified; padded dashboards; automatic red warning lights, replacing the oil pressure and ammeter instruments.

Station wagons offer as an accessory a chrome contour roof luggage rack with chrome assist handles. They also feature positive latch on the second seat, tail gate safety latch, and dual air conditioning as an option. The third seat is of rear-facing type. ■

DH Changes Name

Detroit Harvester Company has changed its name to Dura Corporation. The new name comes from Dura Co. of Toledo, which was DH's first acquisition in the non-farm field 23 years ago.

Management wanted to change the name to get rid of both "Detroit" and "Harvester," since the firm now operates plants in five states and has world-wide sales. The agricultural connotation was dropped because farm machinery now makes up less than 10 per cent of the firm's total business.

Current production includes automotive parts, service equipment, die castings, permanent mold aluminum castings, power take-offs, industrial pumps, street sweepers, power lawn mowers and, of all things, self-actuating contour beds.

Since the Dura merger in 1936, sales have risen from $1 million to approximately $50 million annually.

The Four-door Polara

Oldsmobile 98 Sportsedan

The New OLDSMOBILES

OLDSMOBILE is launching the 1960 version of its family of Series 88, Super 88, and 98 cars with completely restyled bodies and sheet metal as well as front and rear end treatment. This year the line-up includes 17 models, marking the addition of three-seat station wagons to the 88 and Super 88 series. The front end is enhanced with a new zinc die-cast grille.

Supplementing the styling story, the major emphasis is on engines since the mechanical components remain virtually unchanged. Although the engines remain just about the same insofar as specifications are concerned, this year they stress economy rather than power. To this end, Olds offers the 371-cu in. 88 engine with moderate compression ratio and a two-barrel carburetor for maximum economy with regular gasoline. For owners who want more performance the same engine is available with higher compression ratio.

Incidentally, the 88 engine embodies some detail changes due to the decrease in rating and compression ratio. One of these is a new dished head piston to provide for the increase in combustion chamber volume, thus permitting use of interchangeable cylinder heads. The other is a new camshaft.

The 394 cu in. engine is used on both the Super 88 and 98 with compression ratio of 9.75 and a four-barrel carburetor for maximum performance.

For quick reading the engine table reproduced here gives a summary of the engine options described above.

HydraMatic drive has been altered in detail to develop a slimmer case contour, thereby reducing the bump in the front compartment. In addition, the amount of lubricant has been reduced to 9.5 quarts.

A better year round ride is provided by using shock absorbers filled with high viscosity index fluid.

As in the past, the 98 has as standard equipment HydraMatic drive, power brakes and power steering. Air conditioning is available as optional equipment on all models.

Rear axle ratios are as follows: 2.87 to 1 on the 88; 3.077 to 1 on Super 88; 3.23 to 1 on the 98.

Another interesting note is that the Super 88 weight in 1960 will permit use of the smaller 8.50x14 tire as used on the 88 in 1959. This results in a further decrease in steering effort. ■

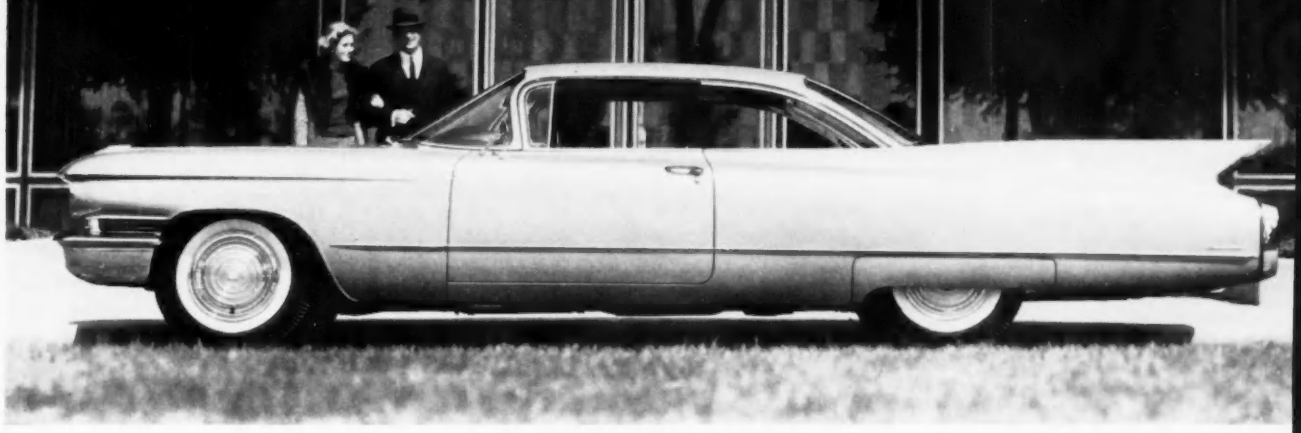
Brief Mechanical Specifications

1960 Oldsmobile Engines

90-deg V-8 OHV type

Car Model	Series 88		Series 98 Super 88
Bore (in.)	4		$4\frac{1}{8}$
Stroke	$3\frac{11}{16}$		$3\frac{11}{16}$
Displacement (cu in.)	371		394
Compression Ratio	8.75 (std.)	9.75 (opt.)	9.75
Bhp (max.)	240@4400	260@4400	315@4600
Torque (lb ft) max.	375@2400	390@2400	435@2800
Carburetor	two-barrel		4-barrel

The 1960 Cadillac



1960 Cadillac Coupe de Ville

For 1960, Cadillac is offering 13 models in three standard and one custom series. All are basically unchanged in dimensions over last year's models.

The Eldorado Brougham has an all-new front end with a new bumper and grille. The rear styling also is new with a newly designed bumper and lighting arrangement exclusive to the Brougham.

The wider and lower appearance of the new front grille on the other 12 models is achieved by the addition of a fine horizontal grille bar between each row of jewel-like ornaments, and the elimination of the center bumper bar. At each end of the front bumper is a broad, visor-like chrome plated housing with two parking and directional signal lamps recessed below.

The front fender crown moldings, in addition to concealing the junction line between fender and hood, have a new chrome ornament with a small amber light on the rear face which serves as a turn signal indicator for the driver.

A custom feature of the 60 special is a fabric covered top. This grained material matches the body cover and is outlined by a narrow molding that is painted in body color and edged in chrome.

A feature giving added driver convenience is the improved spacing between the accelerator pedal and the brake pedal. This is made possible by the design of a new, more compact hydramatic transmission housing. Not only is it narrow but also it is lower.

The major engineering advancement for 1960 involves the brakes. Increased rear brake cooling, provided by new finned and extended rear drums, makes possible the use of larger rear wheel brake cylinders. This reduces front brake loads and gives better cooling at all four wheels.

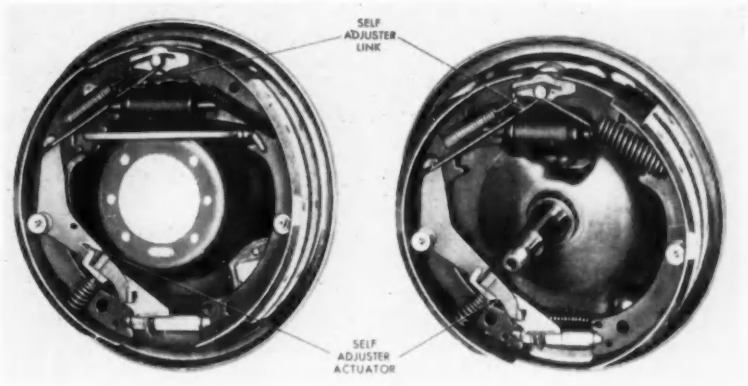
Another improvement in the brakes is a self-adjusting feature that automatically adjusts the brakes as needed when the car is operated in reverse gear. This compensates for lining wear and eliminates the need of manual brake adjustment. The brake pedal is maintained with the same height and feel as when the car is new.

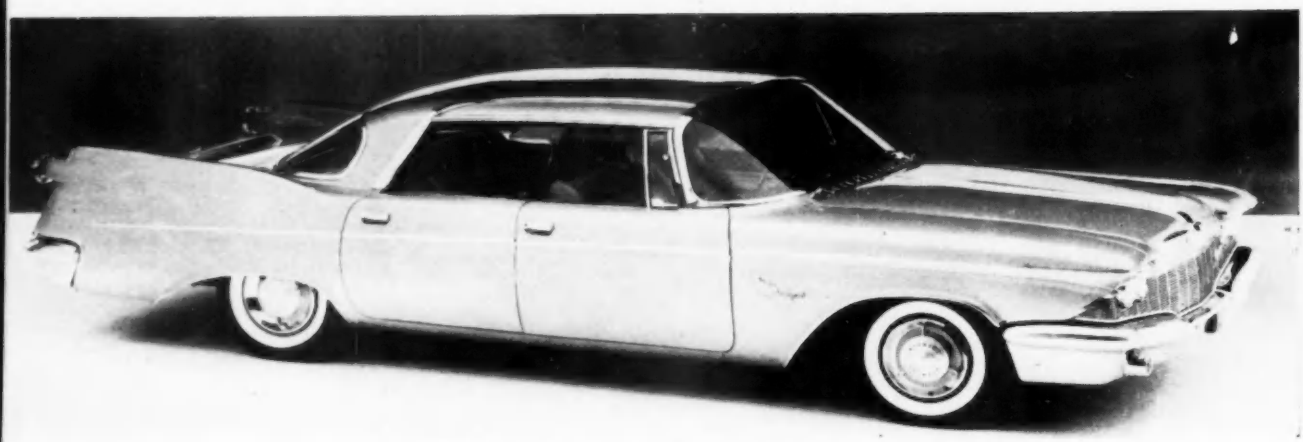
Another new feature is a vacuum-released parking brake. With the engine running, the brake is released automatically when the transmission is put in gear. Thus it becomes impossible to drive the car with the parking brake applied. With the automatic release, the parking brake can be used as a foot operated emergency brake.

Other features for 1960 are: a new low frequency engine mount made of spring steel; a new cantilevered spring on the rear suspen-

(*Turn to page 78, please*)

Self-adjusting brakes used on the 1960 models





Imperial four-door Southampton hardtop

THE 1960 IMPERIAL

CHRYSLER Imperial cars for 1960 have been restyled on the outside and completely redesigned on the interior. In the line-up of models is a four-door sedan and four-door Southampton hardtop in the Imperial Custom, Crown, and LeBaron series; two-door Southampton hardtop in the Crown and Custom series; and a convertible coupe in the Crown series.

One of the noteworthy features is the adoption of the so-called double - layer chromium - plating technique which was described earlier this year. Every exterior plated part will be given the double-layer treatment to impart a brighter and longer lasting finish.

Imperial safety features include: double-padded instrument panel; an improved seat belt; and an emergency warning flasher signal which activates all four turn signals simultaneously even with ignition off.

Interior features, designed for safety and passenger comfort include: a new high tower driver seat; foam rubber padding up to six inches in thickness for both front and rear seat backs; an optional adjustable spot air conditioning unit beneath the steering column opposite the driver; non-glare instrument panel with electro-luminescent lighting; improved AutoPilot with added automatic features; the optional automatic swivel seat; six-way power seat with easier multi-directional control.

The LeBaron has been made even more distinctive in appearance. Key feature is a small rear window which creates a town car look in both sedan and hardtop models, offering rear compartment passengers more privacy. Finger-tip actuated power vent windows are offered for Imperials for the first time, standard equipment on LeBaron models. Windows are geared to small electric motors in the doors, and close tightly to eliminate the need for manual locking devices.

The new elliptical steering wheel is standard equipment, finished in two-toned plastic with grooved hand grips. A heavily padded, deep-dished cross bar supports the rim. A conventional circular steering wheel is also available.

Although mechanical features remain substantially the same, numerous improvements have been made in body construction to provide for added strength and rigidity. For example, the canopy roof is so attached as to add to structural strength. The rear door latch pillar has been made heavier and the front pillar reinforced. Door inner panels are made of heavier gage steel to stiffen door structure.

The 90-deg V-8 engine remains substantially the same. It has a displacement of 413-cu in., compression ratio of 10 to 1, and is fitted with four-barrel carburetor and dual exhaust system. Maximum brake horsepower rating is 350 at 4600 rpm., maximum torque is 470-lb ft at 2800 rpm. ■

Car Cooling Advancements In Process

Several new developments in air conditioning systems for passenger cars are in the works at Harrison Radiator Div. of General Motors Corp., Lockport, N. Y. One experimental system is a combination heater and air conditioner with a single control to meet any outside temperature variations.

Harrison also is working on a new air conditioning system for the Chevrolet Corvair. Both Chevrolet and Harrison have drawn the cloak of security tight around this development.

New Ford Anglia features a low-drag front end and headlamp eyebrows. The two doors are 43 in. wide for easy access to the rear seats.

NEW FORD ANGLIA *features* Ultra-Short-Stroke Engine

FOLLOWING several years of intensive market research in nine countries, British Ford has introduced an entirely new Anglia aimed at making a major dent in the growing small-car market. Although its basic design is conventional, the model embodies a number of unusual features.

The 60.84-cu in. overhead-valve engine is claimed to be more oversquare than any yet produced, having a 3.187-in. bore and 1.906-in. stroke. Piston speed is only 317.6 fpm at 1000 rpm, and 1588 fpm at 5000 rpm when maximum output of 41 hp is developed. Torque is 53 lb/ft at 2700.

This four-cylinder unit has a hollow-cast crankshaft of nodular iron produced by shell molding. Machined combustion chambers and large valves with independent ports are features of the cylinder head. Standard compression ratio is 8.9 to 1, with 7.5 to 1 as an option.

The transmission comprises the first four-speed gearbox used by Ford. Suspension is similar to that on the existing English Fords, employing coil springs and telescopic shock absorbers integral with the front wheel spindles. Long, 45-in. semi-elliptical springs with piston-type shock absorbers are at the rear. The body of the latest Anglia was developed through wind-tunnel testing, and breaks with tradition in having a reverse-angle rear window. This sharp cut-off of the body superstructure is claimed to minimize air turbulence and to provide effective streamlining comparable to any taper of practical dimensions.

Weighing about 1600 lb, the two-door sedan on a 90.5-in. wheelbase is 153.3 in. long, 57.34 in. wide and 54.93 in. high. It is a few inches longer and lower but narrower than the previous L-head Anglia, which is renamed the Popular and continues in production in place of that long-lived pre-war model. The four-door Prefect retains its existing body, offered with two-tone paint and de luxe trim, and is powered by the new ohv engine.

These three cars, together with the unchanged six-cylinder Consul, Zephyr and Zodiac, are now being produced at Ford's recently-completed $28 million assembly plant adjacent to the main Dagenham factory. During the past five years Ford has spent $195 million on expansion—more than any other automobile manufacturer outside America. ■

'58 Ad Outlays Down

The 100 leading national advertisers, including four automobile companies, increased their advertising expenditures 4.6 per cent to $2.3 billion in 1958, compared with $2.2 billion in 1957, *Advertising Age* reports.

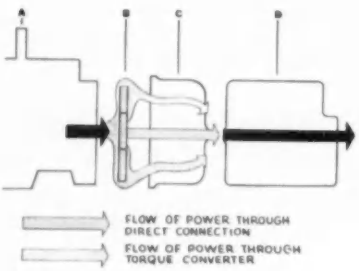
General Motors Corp. headed the 100 companies, despite an advertising cutback for the third successive year—this time to $137.5 million from $144.526 million in 1957. Ford Motor Co. was the second largest advertiser among automobile companies, with an expenditure of $87.9 million, down from $103.5 million in 1957. Chrysler Corp. was third with $58.754 million, a drop from $72.3 million in 1957.

American Motors Corp. was the only automobile company to show an increase. AMC hiked its expenditure to $11.2 million from $10 million in 1957.

The combined expenditures of the four automobile manufacturers was $295.354 million, a drop from $330.326 million in 1957. However, the sum was the second largest dollar segment of the 100 leaders' total.

Caterpillar Introduces New Power Shift Transmission

The guide for the gear range selector on the new Caterpillar power shift transmission machines is horseshoe-shaped. One leg of the horseshoe contains low (1), intermediate (2), and high gear (3) in forward; the other leg contains the same ranges in reverse. Neutral is at the curve of the shoe. The rear lever is a manual safety, used to lock the gear selector lever in neutral.



Schematic operation of the power shift transmission. Torque is delivered by the engine (A) to a planetary gear set (B), where approximately 1/3 of it is directed to the input shaft of the power shift transmission (D). The remaining 2/3's of the torque is directed into the converter (C), then to the transmission input shaft.

POWER shift transmissions, each of which features instantaneous, one lever control of gear shifting without interruption of power and momentum, are now available on Caterpillar D8 and D9 Tractors.

In addition, by a unique utilization of planetary gear versatility, tractor performance is provided which combines the best features of both direct drive and torque converter power trains. Heart of the new arrangement is a planetary gear set, driven integrally by the engine flywheel, which transmits $\frac{1}{3}$ of the engine torque directly to the transmission input shaft, and the remaining engine torque through the torque converter.

Power of both machines has been increased, that of the Cat D8 power shift Tractor is 235 hp, rating of the D9 model is 335.

On the operator's deck, one range-selection lever now takes the place of the flywheel clutch lever, gear selection lever and forward-reverse lever. Only a fraction of a second is required to shift the power shift transmission. The machines can be shifted on the move under full load; then instantly reversed to a high return speed to begin another work cycle. The split-path transmission of engine torque, directing a portion of engine torque straight to the transmission input shaft, provides higher overall efficiency than a standard torque converter drive and retains the solid feel of direct drive tractors. This design feature also retains the impact force necessary in stumping and ripping operations.

The remainder of the engine power is directed through the torque converter, allowing the tractor to automatically adjust travel speed to load, as on normal torque converter drive machines.

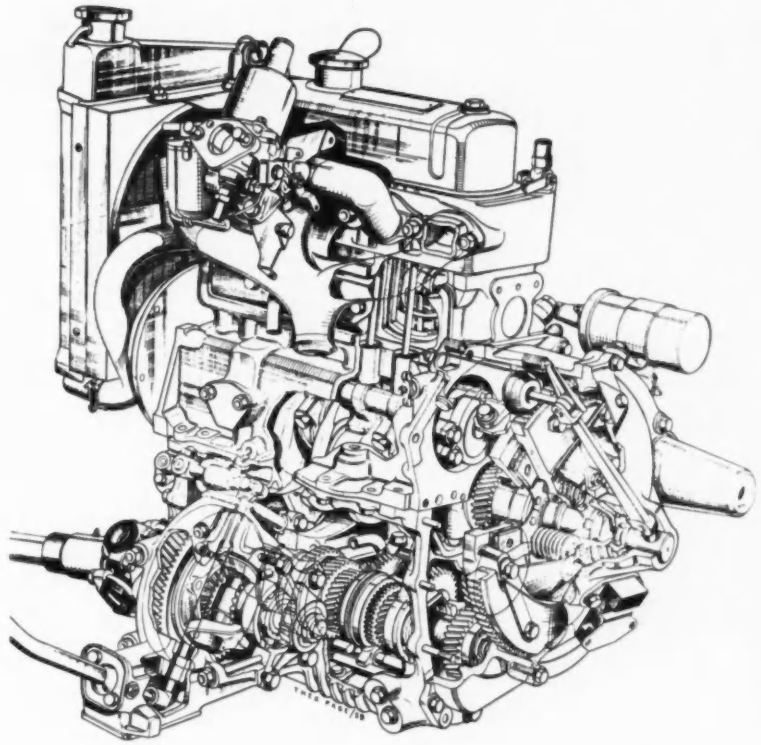
The D8 and D9 power shift tractors have a three-speed forward, three - speed reverse, planetary transmission. It consists of five in-line gear trains, each with a separate clutch. Two of the planetary trains are directional; three constitute the low, intermediate and high gear ranges. Control of the clutches is by a direct acting hydraulic control system, designed and built by Caterpillar. Design of the hydraulic system is such that the speed range clutches are engaged first when shifting, followed by engagement of the forward or reverse clutches.

A safety lever is installed on the selector lever pedestal, which locks the selector lever in place when in the neutral position. The control system also contains a hydraulic safety valve, which automatically shifts the transmission into neutral when the engine is stopped.

Lubrication of the power shift transmission on both model machines is afforded by a separate vane-type pump located on the flywheel housing. It supplies oil through an individual filter to the transmission power clutch control unit, where it serves as hydraulic fluid for the transmission clutches.

Lubricant is then channeled to transmission bearings, gears, and clutch plates. On the D9, the transmission oil sump is a separate compartment, whereas on the D8 power

Power Plant of the Morris Mini-Minor and Austin Seven



PRESENTED here is a cutaway drawing of the Morris Mini-Minor and Austin Seven power pack. The gearbox bolts directly beneath the 51.74-cu in. engine to serve as a sump, and one gallon of engine oil lubricates the entire transmission and integral differential. Primary drive is transmitted through a 7 1/8-in. clutch to a helical spur gear sleeved on the crankshaft end. This meshes with an intermediate gear driving the input shaft of the four-speed gearbox which is directly coupled to the spur gear of the final drive. The differential is linked to the front-wheel half-shafts by Hooke-type universal joints whose spider is gripped by pre-loaded bonded-rubber bushings. Rzeppa constant-velocity joints are used at the outer ends of the shafts. ■

shift model, it is common with the bevel gear and steering clutch compartments.

Simultaneously with the introduction of the power shift transmission for the D9 Tractor, Caterpillar Tractor Co. has announced the availability of a new series D9.

Designated the Caterpillar D9 Series E tractor, the new unit will be available in a choice of direct drive or torque converter drive, as well as the power shift version.

The addition of a more efficient turbocharger contributes to an increase in power—now up to 335, compared to the previous 320. Dimensionally, the new Series E machine is 1-7/16 in. longer, 1 in. higher, and of the same width as its predecessor.

Improvements in the new D9 Tractor are chiefly concentrated in the undercarriage components. The track group is completely new — characterized by dimensional increases and strengthening of all components.

Service life of the track shoe has been lengthened by increasing grouser height from 3 1/16 in. to 3 7/16 in. Track bolt diameter has been increased from 7/8 in. to 1 in. increasing strength 23 percent.

Additionally, improvements have been made to assure long flange life on track rollers. Inner flange diameters on the double flange rollers have been increased 1/4 inch to 11 7/8 inches. Thickness of the inner flange has been increased 1/8 inch.

To match the increased track link pitch, new spoke-type sprockets with hunting tooth design are used. The 10 1/4 inch size sprocket-tooth pitch provides increased tooth backlash and increased tooth thickness to reduce tip wear.

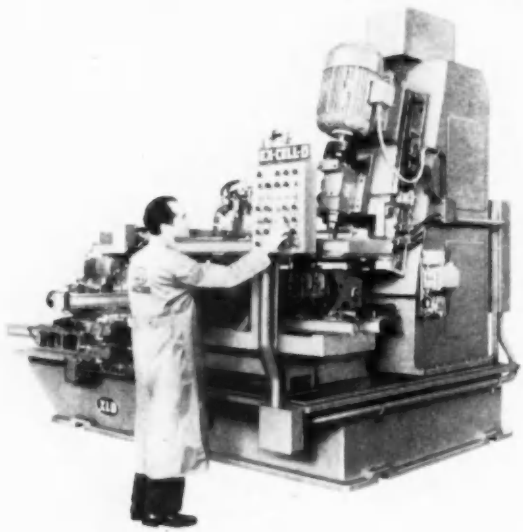
The use of a cam-type equalizer bar provides better machine stability, particularly in side-hill operations. The new bar makes rocking contact with a bracket welded to the main frames, replacing the previous pivot-pin connection.

Latest design changes such as anti-friction track carrier roller bearings and lifetime lubricated track rollers, track carrier rollers and front idler bearings are included in the new Series E models. ■

NEW PRODUCTION and PLANT EQUIPMENT

FOR ADDITIONAL INFORMATION, please use reply card at back of issue

Boring Machine Handles Two Different Engine Blocks



Ex-Cell-O line boring machine features include an electrically operated tool positioner to insure that boring bars withdraw without leaving tool drag back lines, a system of passing air through the camshaft boring bar directed towards the cutting tools for the clearance of chips, and oil mist lubrication to all boring bar support bearings.

THIS custom boring machine is designed to finish line-bore the crank-shaft and camshaft bearing diameters, finish bore two dowel holes and finish bore; chamfer and face the distributor drive hole. These multiple operations are completed on two different styles of engine blocks, a four cylinder and a six.

Both crankshaft and camshaft boring bars are designed common to both parts, in spite of the difference in length of the two engine blocks. This eliminates changeover time, since it becomes possible to feed either component into the machine indiscriminately. The difference in the working strokes of the boring bars when machining a four or a six cylinder block is compensated for automatically. The tooling for the precision boring of the distributor hole is quill mounted on a standard precision spindle, operating from a vertical column. *Ex-Cell-O Corp.*

Circle 64 on postcard for more data

High Speed Engine Lathe

OFFERED in three models, an all-new heavy-duty engine lathe has been developed.

Swings over the bed of 40½, 45½, and 49 in. are available. The lathe is equipped throughout with anti-friction bearings and automatic lubrication to all parts, and is powered by a 75 hp drive with no speed-up gearing. Swing over the compound ranges from 25¼ to 36 in. for the three models. All gears are hardened and ground or shaved.

Features include a headstock with 36 speeds in true geometric progression and automatic calculation of cutting speeds through a single dial control; an overall speed ratio of 160 to 1; and opposed-helix final drive gears. It is claimed that the headstock is capable of transmitting 75 hp in all speed ranges. End gearing is totally enclosed. *Sidney Machine Tool Co.*

Circle 65 on postcard for more data

High Speed Band Saw

STARRETT Safe-Flex high speed steel band saws are continuous cutting tools of high-quality, high-speed steel with extremely hard cutting teeth for cutting at maximum speeds and feeds.

The band has the ability to retain hardness up to red-heat temperatures of 1100 F. Thickness ranges from 0.025 to 0.042 in. They are available in regular, hook-type and skip-tooth types in four widths and a wide variety of pitches. *The L. S. Starrett Co.*

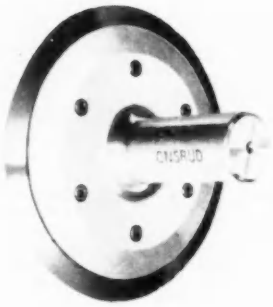
Circle 66 on postcard for more data

Circular Milling Cutter

THIS circular milling cutter is a replaceable ring type which uses a simple but effective method of mechanically holding a solid carbide ring to the cutter body.

The body consists of a shank and a retaining plate. The shank has a male recess and the carbide ring has a female recess or groove. The ring is held to the shank by the retaining plate which is mounted to the shank with Allen screws. The recesses are a safety feature to prevent the ring from flying out in case of carbide fracture.

The cutters are available in eight cutting diameters of 1 to 8 in. In the machining of stainless steel honeycomb core the 2 and 3 in. diameter cutters are being run at feeds



Onsrud circular milling cutter for machining stainless honeycomb core

of 20 to 100 rpm. The minimum depth of cut is 0.015 and the maximum depth is 0.200 in. *Onsrud Cutter Mfg. Co., Inc.*

Circle 67 on postcard for more data

Tracer System

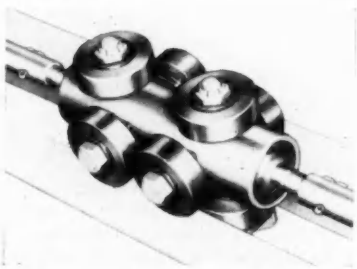
AN economical two dimension tracer system has been introduced. The system is electro-mechanically controlled and will follow any contour around a 360 degree path at a constant speed, regardless of direction. The value of the cutting speed can be varied manually, or can be automatically controlled as a function of spindle speed to maintain a constant feed rate in inches per revolution of the spindle.

The system is available as a package and can be applied to existing machine tools. It incorporates a rotating eccentric stylus design. The stylus assembly, on contact with the template, continuously feeds electrical signals to X and Y axis servo drives. These low power signals are amplified to actuate a mechanical device which controls table movement for any value of the X and Y coordinate axes. *Seneca Falls Machine Co.*

Circle 68 on postcard for more data

Conveyor Trolley

EITHER light or heavy duty wheels can be used with this American



American MonoRail trolley assembly

"chainless" trolley assembly.

One standard trolley housing for all capacities enables the user to convert an existing "chainless" conveyor from 100 to 400 lb capacity by merely changing the wheels. The eight-wheeled conveyor trolleys are connected by steel rods terminating in ball and socket joints. The line pull is directed through the centerline of the trolley. *The Conveyor Div., American MonoRail Co.*

Circle 69 on postcard for more data

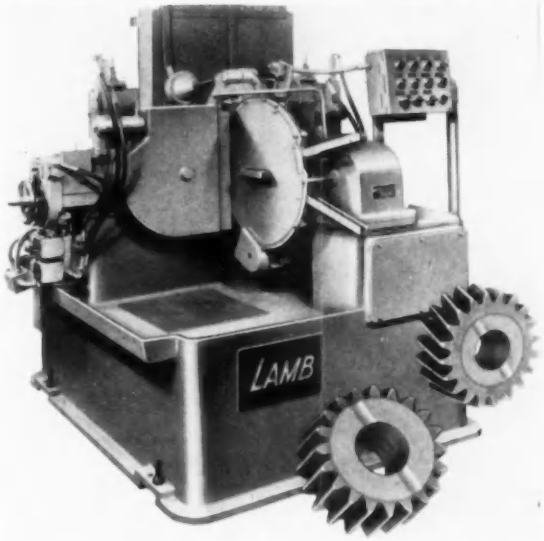
New Honing Machine

A NEW honing machine, designed for production runs, tool room work, and salvage operations, has been announced.

Called the Model "J2," it provides variable spindle speeds from 225 to 525 rpm, on an optional range of 450 to 1050 rpm. It is powered by a ½ hp, 110-v, 60 cycle, single phase motor. The complete drive, motor, and coolant tank are enclosed in the heavy steel base, the cover of which is louvered to permit adequate ventilation. *Superior Hone Corp.*

Circle 70 on postcard for more data

Machine Grinds Oil Grooves In Transmission Gears



F. Jos. Lamb machine grinds oil grooves in both thrust faces of from 800 to 1350 gears per hour. The machine accommodates various sizes of gears by simply changing the feed wheel. The grinding wheel feed slides are hydraulically powered and have micro adjustments. Wheel dressers are also adjustable to any desired radius.

DESIGNED and built to grind oil grooves into both thrust faces of hardened transmission gears, this machine features a production rate of 800 to 1350 parts per hour, depending on gear size. The machine operates continuously and is completely automatic including wheel dressing and compensation for wear.

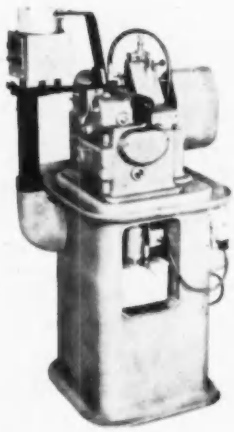
The parts are chute fed to a rotating spur type feed wheel that is chain driven. The chain rides on the perifery of the feed wheel and acts as a clamp, holding the parts in the spur pockets as they are passed between the opposed grinding wheels. After grinding, the parts drop out of the spur pockets into a discharge chute. *F. Jos. Lamb Co.*

Circle 71 on postcard for more data

Hopper Feed Hobbing Unit

THE Mikron #19 pinion cutting machine of the hobbing type is available as a fully automatic hopper and magazine feed machine, for cutting pinions with a tooth surface finish of 32 microinches. Normal machine capacity is 15/32 in. in diameter by 19/32 in. in length.

The hopper is attached to a vibrator unit which moves the blanks along a guide rail which spirals upward inside the hopper to the magazine. The guide rail is so made that only pieces in position for cutting can enter the magazine. At the bottom of the magazine, a loading device pushes the work piece into the machine.



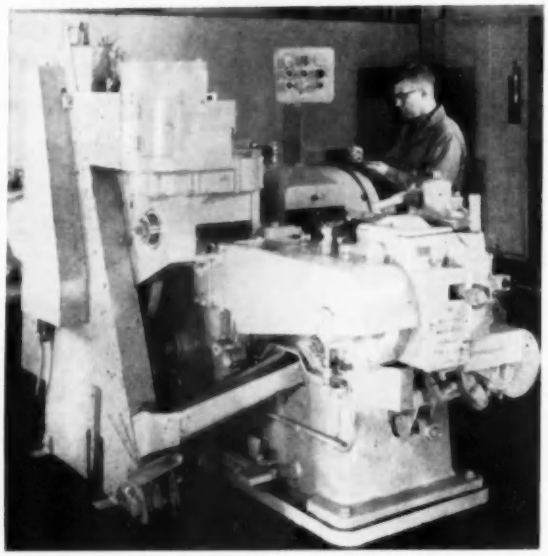
Mikron #19 hopper feed hobbing machine

After the part is cut, the hob lifts, and the slide moves to its starting position. The deburring tool retracts, the piece is ejected, and the cycle repeats. *Russel, Holbrook & Henderson, Inc.*

Circle 72 on postcard for more data

NEW PRODUCTION and PLANT EQUIPMENT

Single Die Boltmaker Makes Parts From Wire



Pictured is a newly designed single die boltmaker, a one-heading-die machine incorporating pointing and thread rolling stations. It is a high-production unit which performs all of the separate operations of conventional fastener making—heading, pointing and thread rolling. (The National Machinery Co.)

Circle 73 on postcard for more data

Michigan-Lorenz versatile high speed hobbing machine

Versatile High Speed Hobbing Machines

A LINE of highly versatile high speed hobbing machines has been added to the Michigan-Lorenz line of hobbers and gear shapers.

Hob spindle speeds are variable from 20 to 400 rpm simply by turning a control knob. Axial and radial feeds are also variable. Designed for automatic cycling, the machines can be operated either as automatic single-cut or 2-cut machines, for step-hobbing, and with automatic variation of feeds and speeds within a work cycle.

Two methods for distributing wear are available—continuous hob shifting and automatic increment hob shifting. With the latter method, the tangential hob slide is hydraulically clamped during the hobbing operation, providing maximum rigidity and accuracy. *Michigan Tool Co.*

Circle 74 on postcard for more data

Drill Point Grinder

A NEW drill point grinder that will grind conventional, formed, or split points on a high-precision, high-production basis has been introduced.

The V-rest drill holder securely holds and positions each drill for grinding, eliminating the need for time-consuming loading or adjustment of bushings, jaws or collets. *Morse Twist Drill and Machine Co.*

Circle 75 on postcard for more data

Injection Molding Units

TWO, compact design vertical-injection molding machines for insert, contact and plug molding have been designed.

They are available in 1 and 2-oz capacities per plastic shot and feature an exclusive sliding table which permits the operator more freedom of movement in positioning inserts. Push button controls take the place of levers and treadles, reducing operator fatigue and increasing production. *Progressive Tool & Die Co.*

Circle 76 on postcard for more data

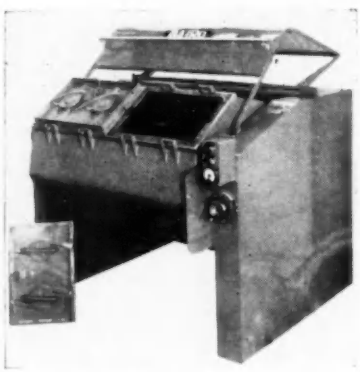
Finishing Machine

THIS horizontal barrel finishing machine with ¼ in. steel plate on the frame requires only five square feet of floor space.

Called the "Finishmaster," the machine has lightweight doors of armor plate that can be lifted by hand. It is under four feet high so all loading and unloading equipment can be carried over the top of the machine.

The unit has a variable speed drive for barrel speeds between 8 and 24 rpm to finish any material. It also has a built-in brake motor to hold the barrel in position, and a limit switch which permits jogging but not running of the barrel when the guard is raised. *The Baird Machine Co.*

Circle 77 on postcard for more data

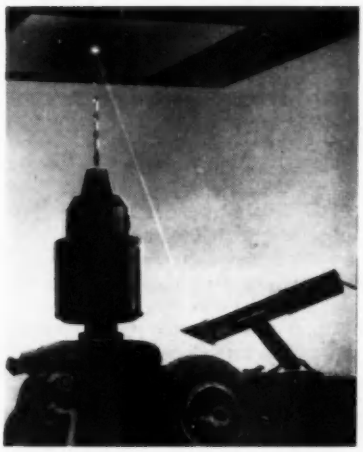


Baird "Finishmaster" barrel finishing unit

Locator Light

PICTURED is a newly designed locator light for drill presses, terminal setters, punches, riveting machines and similar equipment.

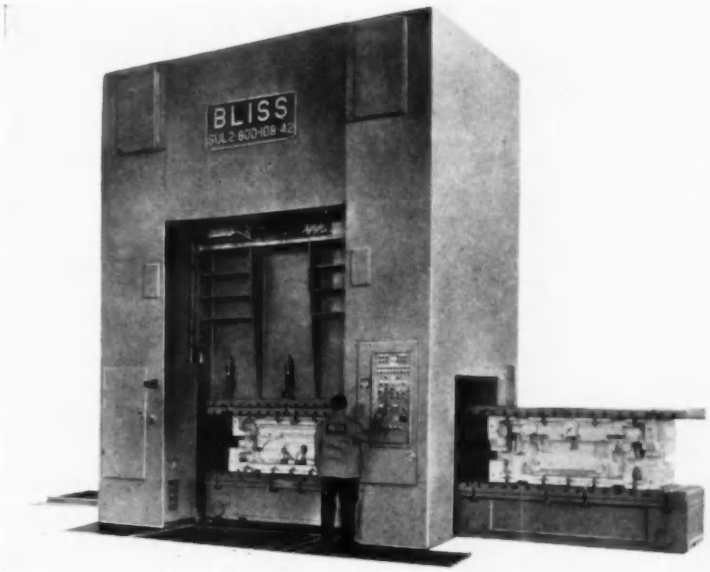
Called Locolite, the device pinpoints



Black & Webster locator light

the work area accurately and quickly with a beam of light. It is particularly useful in riveting and terminal setting, where the desired "spot" is often hidden by the work itself. Measuring 3½ in. long, the adjustable device comes complete with transformer, prism, bulb, and mounting bracket. *Black & Webster, Inc.*

Circle 78 on postcard for more data



E. W. Bliss Co. press has sliding bolsters, other unique die changing devices

Press Features Unique Die Changing Devices

THIS press features unique die changing devices and is designed to afford rapid die changing to eliminate non-productive hours when dies in a press line are changed from one part to another.

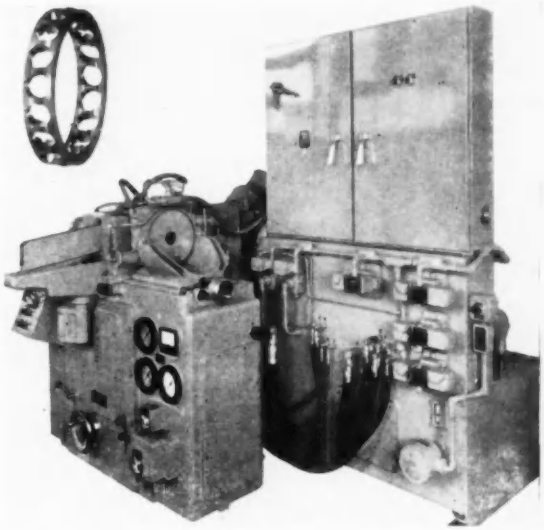
The press is equipped with two movable bolster plates, each of which can be rolled out through openings in the uprights of the press so that one is easily available for die change by overhead cranes while the other is in production. With a new die in place on the inactive bolster, die changing simply involves rolling out the previously active die and rolling in the new one. *E. W. Bliss Co.*

Circle 79 on postcard for more data

Automatic Drilling Machine

THIS automatic drilling machine is designed especially to drill cages or separators for precision ball or roller bearings. The index mechanism is said to be extremely accurate and can handle any number of holes by changing index plates. All operations are performed hydraulically, including the rotation of the spindle which allows extreme flexibility in selecting proper spindle speeds and feeds for maximum production in drilling different materials. The push button control station provides for independent operation of each motion of the machine to facilitate set up. All motions are interlocked to prevent damage to the machine or parts in the sequence of operation. Chips are washed away by a heavy flow of coolant and removed to containers by a conveyor.

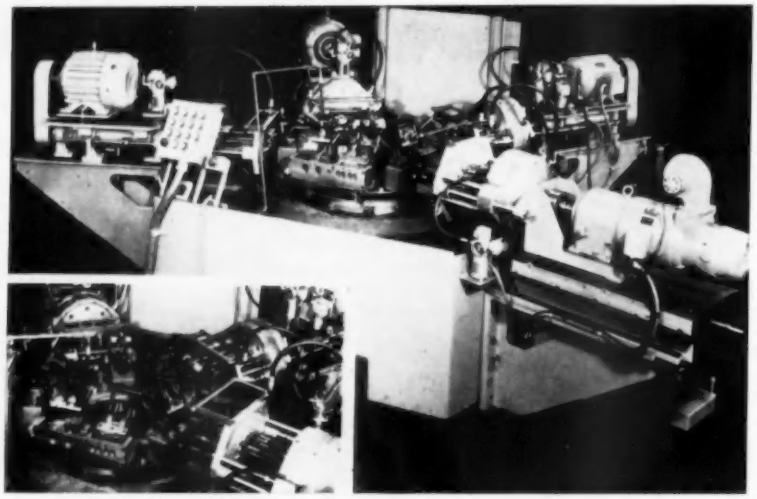
The machine will handle separators



B. M. Root automatic drilling machine has an actual production on silicon iron bronze separators requiring 22 holes, of 45 per hour.

4 to 10½ in. in diameter, width 11/16 in. minimum, and drill 1⅜ in. holes in bronze. *B. M. Root Co.*

Circle 80 on postcard for more data



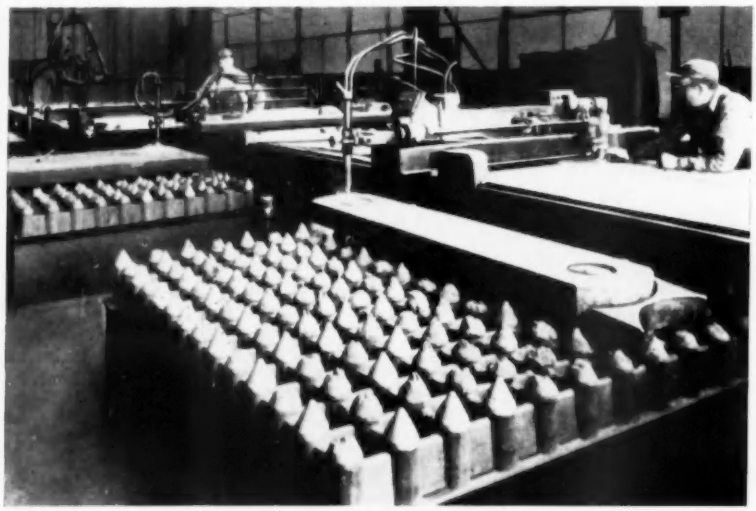
Zagar heads are fed by 7½ hp, 10 in. stroke units. Cycle is completely automatic, with manual unload. Production is 700 pieces per hour.

Machine Reduces Stations By Changing Fixtures

THIRTEEN different jobs, all with different hole patterns, are drilled, countersunk, reamed, and tapped with the same four heads on this machine. The set-up is accomplished by having three different tables, subplate mounted, removable in their entirety.

Each table has five stations—four working and one unload. Four parts are in each jig of each station. The station sequence is: drill, drill and countersink, ream and spot face, then tap, by individual lead screw for close depth. *Zager, Inc.*

Circle 81 on postcard for more data



Cleveland flame-cutting table accommodates cast iron cones

Cast Iron Flame-Cutting Table For Use With Gas Torch

THIS flame-cutting table is designed for use in shops that cut steel plate by use of a gas torch.

It is made of cast iron and machined to accommodate cast iron cones. Plates rest on the cones while being cut. The cones provide considerable air space between a plate and the table, minimizing the intensity of the heat of a burning torch reaching the table.

Standard table sizes are 80 by 87 in. and 81 by 63 in. Two or more can be fastened together to obtain larger table areas. *The Cleveland Crane & Engineering Co.*

Circle 82 on postcard for more data

Induction Heating Unit

A NEW 10 kw output high frequency induction heating unit, Model L1-10C-1, operates at approximately four megacycles for processing semiconductor and other non-conductive materials.

The unit has a totally enclosed cabinet with a gasketed door for dust and fume protection. Outside dimensions of cabinet are 40 in. wide by 40 in. deep by 76 in. high. All metal frame and panel construction is used throughout to protect internal components and prevent excessive radio frequency radiation. The entire unit is mounted on heavy channel iron skids, and overhead cross members are available for lifting. Net weight of the unit is about 1950 lb. *Lindberg Engineering Co.*

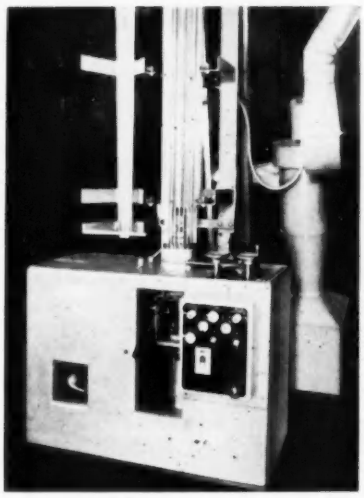
Circle 83 on postcard for more data

Vertical Cut-Off Saw

KNOWN as the National Copper vertical cut-off saw, this unit has a maximum production rate that ranges from 100,000 pieces per hour for 3/16 in. diameter tubing to 25,000 pieces per hour for 1 in. diameter tubing.

It produces burr-free lengths of from ¼ to 7 in. With this unit, material up to 20 ft in length is fed vertically. It occupies a floor space area of 40 by 50 in. *The National Copper & Smelting Co.*

Circle 84 on postcard for more data



National Copper vertical cut-off saw

Reaming Cutters

A LINE of reaming cutters which can be readily adjusted for size while locked in the bar is now being produced.

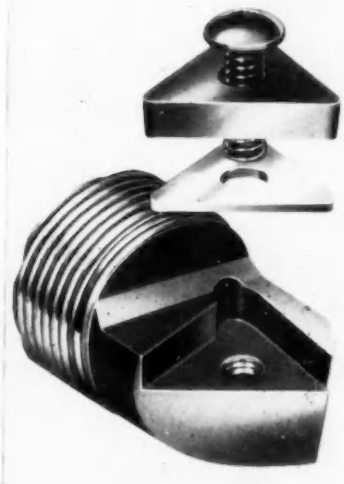
Known as "Micro-Flote" the devices feature extra-hard adjusting screws with National fine threads, plus a smooth sliding action on ground surfaces, according to the maker. Adjustment to 0.0002 can be made without loosening the locking screw on the bar. The reamers also offer full floating action to compensate for errors in alignment as well as ample chip clearance and will be available in a full range of sizes. *Muskegon Tool Industries, Inc.*

Circle 85 on postcard for more data

Cutting Tool Set-Up

A DEVELOPMENT which combines specially designed Microbore cutting tool holders with Kendex throw-away inserts has been announced.

Suited for rough cutting, the new arrangement uses the Kennametal



DeVlieg cutting tool set-up

Kendex, mechanically-held throw-away inserts, for the cutting edge. Inserts can be provided in the hardest grades of carbide because no brazing is required.

Costs of re-grinding are eliminated because a replacement tip is merely put in place and held there by a screw-on bottom or clamp. *DeVlieg Microbore Div., DeVlieg Machine Co.*

Circle 86 on postcard for more data

Dividing Heads

A NEWLY developed swivel base available for all models of the complete line of L-W dividing heads makes them fully universal. Rising blocks have also been added to the line.

All L-W dividing heads have a ball bearing thrust on the worm

L-W Chuck Co. dividing head

shaft and rear end of the spindle, and the headstock spindle has a threaded nose. There is a large tapered bearing which is adjustable for end play. The head tilts past 90 degrees. *L-W Chuck Co.*

Circle 87 on postcard for more data

Balance Milling Machine

A THREE-WAY balance milling machine that weighs and machines automotive connecting rods to a plus or minus 1/16-oz weight tolerance at a production rate of 313 parts per hour has been designed.

The obtainable precision is the result of an electronic-memory weighing system that controls the depth of feed of the machining units; and a method of providing electrical compensation in the depth control of a drill spindle. This electrical compensation system allows for variation in metal removal caused by the point of the drill. *Snyder Corp.*

Circle 50 on postcard for more data

Non-Skid Compound

A NON-SKID compound made to be applied to industrial surfaces for long-lasting safety underfoot has been announced.

The grit-impregnated bonding resin, called M-S-A Dura-Grip, is designed for both inside and outside application on stair treads, plant floors, ramps and slopes, and around machinery. In average warm temperatures, it allows for light traffic in six hours after application, for heavy traffic in 16 hours.

When fully cured, the compound resists grease, oil, dilute acid, alkalies, and most common solvents involved in industrial spillage. *Mine Safety Appliances Co.*

Circle 51 on postcard for more data

Cutter Bar Turner

A RETRACTABLE cutter bar turner has been designed for the 2AB single spindle bar automatic.

Capable of handling bars from ½ to 2¾ in. in diameter, the new turner clamps directly in the dovetail of the pentagon turret. One coolant line, emanating from the pentagon coolant distributor, is the only separate connection necessary in mounting the bar turner on the machine. *The Warner & Swasey Co.*

Circle 52 on postcard for more data

Machine Cycle Control

AN automatic milling machine cycle control has been introduced for use with the 200 Series Hypowermatic milling machine. The control panel controls all functions or movements of the machine plus provisions for auxiliary operations such as fixture clamping or indexing. For each machine function there is a row consisting of 24 holes allowing the operator to "peg-in" complex automatic milling cycles involving up to 24 steps or events.

Set up consists of inserting plugs in holes opposite the desired function in proper sequence. Trip dogs, positioned on machine table and spindle carrier, initiate each new action and Telematic control directs the action. *The Cincinnati Milling Machine Co.*

Circle 53 on postcard for more data

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Steel Pintle Chain

Having application in a wide range of industrial and agricultural machines and equipment, a new type of steel pintle chain has been developed.

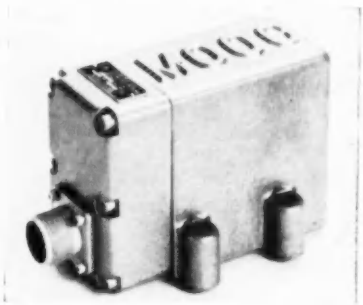
Called the "600" series, it is designed for applications where cost, operating conditions, maintenance requirements, or use with cast sprockets are governing factors. *The Locke Steel Chain Co.*

Circle 88 on postcard for more data

Industrial Servovalve

Moog 71 series high performance industrial servovalves operate at system pressures ranging from 500 to 4500 psi. They are available in four sizes: 1, 2.5, 5, and 10 gpm rated flow at 1000 psi valve drop and 15 milliamperes input current.

Typical applications include automatic machine tools, earth moving



machines, material handling equipment, nuclear reactors, and edge controllers. *Moog Servocontrols, Inc.*

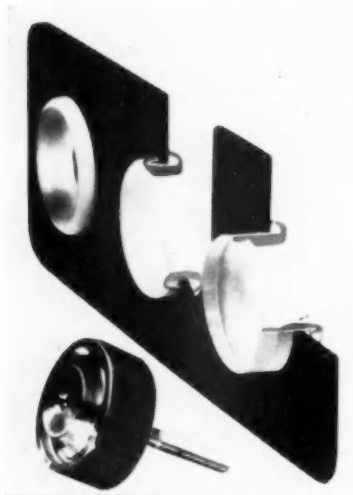
Circle 89 on postcard for more data

Solid Grommet

A one-piece, solid grommet of Zytel 103 nylon, having unusual safety and installation features has been developed.

Called "Flip Grommet," because of the simple method of installation, the device fits snugly and cannot shake loose or pop out, the maker states. The nylon wears well and does not chafe material, such as electrical wire, which may pass through it. It is for use in the temperature range of —65 to 300 F.

To install, insert the grommet



through an aperture and flange it over with a simple tool. The tool may be used in a common drill or arbor press, or in a hand pressure mechanism.

Each size, from 3/16 to 2½ in. in diameter, fits sheet gages ranging from 0.025 to 0.250 in. in four basic lengths. *Western Sky Industries.*

Circle 90 on postcard for more data

Power Transistor

Designated 2N297A, a military type germanium power transistor has been announced.

The unit, which meets MIL-T-19500/36A, can be used in numerous military applications, such as in missiles, supersonic aircraft, and also in many commercial fields for high-current switching, amplification, regulators, and power supply circuits.

It has a maximum collector voltage rating of 60 volts, and a maximum collector current rating of 5 amp. It has a dissipation of 35 watts at 25 degrees C and 10 watts at 75 degrees C. *Bendix Aviation Corp.*

Circle 91 on postcard for more data

System Components

Chandler Evans Corp. has developed six new components for use in connection with hot gas servo systems for missiles and space vehicles.

These units include a lightweight hydrazine reaction chamber, a hot gas reaction chamber for laboratory use, a hot gas pressure relief valve, a solid propellant hot gas filter, a reed-suspended closed center servo valve, and a propellant flow modulating and pressure regulating valve.

Circle 92 on postcard for more data

Charge Control Unit

Introduced by Exide, a completely automatic unit helps prolong the high-capacity working life of electric industrial truck batteries by providing proper charge control.

Interconnected with the charging equipment, the MP-3 initiates the charging process when the control indicator of the electric timing switch is dialed. A spring-pin metal stop

above the control indicator on the door of the case makes it simple to pre-set the unit for a normal three or four-hour daily finishing charge. The stop also can be lifted to move the control indicator to six or eight-hour weekly charge positions. *Exide Industrial Div., The Electric Storage Battery Co.*

Circle 93 on postcard for more data

Protective Coating

A general-purpose, one-part neoprene rubber based coating that provides chemical, abrasion and weathering resistance has been developed. It is for the protection of metal, wood, concrete, cloth and some plastics.

Designated as "Coro-Gard 1706" protective coating, it has high adhesion to unprimed steel, aluminum, copper, galvanized steel, etc. When applied to these and other surfaces, the material will air harden to a tough rubbery protective film that has good resistance to the corrosive action of chemicals and fluids. *Adhesives, Coatings, and Sealers Div., The Minnesota Mining and Mfg. Co.*

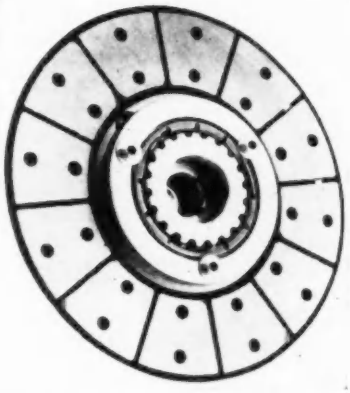
Circle 94 on postcard for more data

Spline Drive Armatures

A new line of spline drive armatures for use on integral hp electric clutch-coupling and brake applications where shock-loading or vibration-loading are problems has been designed.

The assemblies are available in 8, 10, 12, and 15-in. diameters. They can also be used on special clutch applications where the equipment builder or user furnishes the male splined hub. No mounting adjustment is required. The armature is pressed tight against the magnet face at the completion of mounting and on release, the airgap is set automatically by the autogap spring.

The armature adapter, made of Meehanite, is bolted to the armature using buttonhead socket screws and lock nuts. The internal involute spline,



which is cut in the adapter, is lubricated with molybdenum disulfide for initial break-in and needs no further lubrication. The alloy steel splined hub has a tapered bore into which the tapered bushing is pressed giving the equivalent of a shrink fit. A retainer ring at one end of the hub prevents the armature from being backed off too far. Automatic compensation for magnet and armature wear is provided by the autogap spring. *Warner Electric Brake & Clutch Co.*

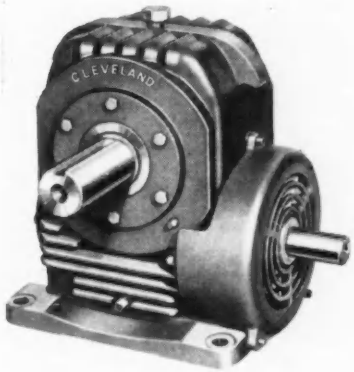
Circle 95 on postcard for more data

Speed Reducers

Pictured is one in a series of "high horsepower" speed reducers, recently introduced.

The line features a rugged one-piece design housing of high quality cast iron, ribbed for maximum strength and heat dissipation. A cooling fan is mounted on the input end of the worm shaft and is equally efficient in either direction of rotation.

Worms are cut integral with the shaft and ground to a high surface finish on both thread flanks. Heat-



treating is by means of an acetylene-oxygen flame at 3300 F.

The gears have centrifugally cast bronze rims with a high tin-nickel content, made integral with a cast iron center. Gear shaft extension diameters are especially large to permit increased overhung load capacity.

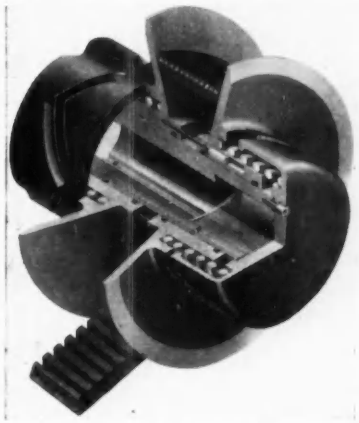
Bearings are Timken taper roller type on both the form and gear shafts. They provide adequate thrust and radial capacity. Worm bearings are mounted directly in the housing bore for greater rigidity. *The Cleveland Worm & Gear Co.*

Circle 96 on postcard for more data

Motion-Control Sheave

The "MCS" variable-speed sheave is designed to hold a constant driven speed during changing torque loads.

Cam pressure is exerted only when the load requires it. Power is transmitted equally to both movable flanges through a series of torsionally resilient rubber cam followers. The side-wall pressure on the belt varies in proportion to the torque required to carry the load. Since the grip on the



belt increases as the load increases, the pitch diameter is maintained and the driven speed kept constant regardless of the torque condition. Belt life is prolonged because the flanges are not being continually squeezed against the belt by heavy thrust springs. *T. B. Wood's Sons Co.*

Circle 97 on postcard for more data

Large Induction Motors

A new line of large a-c motors in open drip-proof enclosures in ratings from 150 to 2000 hp at 1800 and 3600 rpm has been announced.

The motors are designed to serve as drives for pumps, fans, blowers, and compressors in many applications.

To meet special application demands, several bearing constructions are offered. Bronze inserts are used in the bearing capsule to achieve close tolerance running fits between the capsule and shaft. *The Louis Allis Co.*

Circle 98 on postcard for more data

Vacuum Valves

Made for use in vacuum processing applications where high flow rates and positive sealing are of primary importance, a line of diaphragm-operated vacuum valves has been designed.

Capable of sealing and holding vacuum to within 0.5 in. Hg absolute for an indefinite period of time, the valves feature resilient synthetic O-ring seat seals combined with direct metal-to-metal seat stops to assure a positive seal without O-ring deterioration in heavy-duty service. *The Sinclair-Collins Valve Co.*

Circle 99 on postcard for more data

METALS

Steel Users May Have to Turn to Conversion Deals for Cold Rolled Sheets. Imports of the Metal Set New Record

By William F. Boericke

By mid-September it was evident that the steel strike was taking its toll among small and medium size consumers. Scattered shortages have forced curtailment or even shutdowns at some plants. The movement of course will be accelerated as the strike drags on. On an industry-wide basis, inventories are being depleted at the rate of 1 million tons a week. Assuming a minimum working level of about 14 million tons, by early October inventories would be down to that amount.

However, a survey of industrial users indicates that nearly half of those interviewed would expect no inventory problems through September. It has become abundantly apparent that most steel consumers did a good protective job before the strike. Quite a number report their inventories in mid-September were higher than they expected them to be at that time.

Delays in Restoring Steel Mills

The worst hardships may show up after the strike. It will take time to get the mills up once more to capacity. A slow startup is expected. The terrific pace that characterized the second quarter of the year meant that maintenance and repair jobs had to be neglected. There can't be full operations until deferred repairs have been made, which won't be made easier because of the long shutdown. About two weeks at least would be needed to pour ingots and make slabs and another two weeks or more before finished steel would be available.

During this period buyers would be anxious to rebuild depleted stocks for an expected business upsurge in the fourth quarter. Steel makers are anticipating this, and are not seeking new fourth quarter business. They will have enough to do to make good on deliveries to regular customers.

In consequence, it seems quite likely that hard pressed users may have to turn to conversion deals for cold rolled sheets. These will cost 50 to 100 per cent more than mill prices for the same products, but it's likely there will be little alternative.

Steel from Abroad

Foreign steel offers another way out. Since the strike began steel products from abroad have been pouring into this country at an unprecedented rate. According to the president of Republic Steel, much of the imported steel has been bought under long term agreements. For example, on the West Coast Japanese steel makers have agreed to supply American customers only on condition they would continue to buy steel from Japanese mills when the strike is over.

The Department of Commerce points out that steel imports in July totalled 430,000 tons, the highest month ever recorded. Total for the first seven months was 2.3 million tons, compared with only 1.7 million tons for the full 1958 year.

In general, prices for imported steel are higher than pre-strike prices for domestic steel. But for prompt delivery, substantial premiums may be asked.

Scrap prices remain generally firm. Export demand along the Eastern seaboard imparts strength. However, there is a big tonnage of home scrap that has accumulated since the mills shut down and will be delivered when they resume production.

Copper Market Calm Despite Strike

The four largest copper mines have been struck since mid-August along with their smelters and refiners. The overall effect has been to cut domestic copper output about 75 per cent. The loss through September has been about 75,000 tons of metal.

The strike found the industry quite well set to take it. Inventories of copper in the hands of the fabricators were at a record high of 518,000 tons. Prior to the strike production was exceeding shipments by about 10,000 tons a month. Two important producers had cut down mine output and this would probably have been followed by others if the strike had not occurred. Consumption abroad had eased and a surplus of production approximately 35,000 tons a month over deliveries to foreign consumers was indicated.

In consequence there has been no frenzied bidding for copper either in New York or London. The few producers still operating have advanced their price to 31½ cents and some custom metal is offered at 33 cents. Limited dealer supplies are a cent higher. But sales at premium prices are few.

The situation could change if the strike is prolonged into October. It is estimated that no real distress will be registered before then. A strike in the Chilean mines could cause speculative buying, and a dock strike that would interfere with imports of foreign copper would have the same effect. Neither can be ruled out.

Fundamentally there is no reason to expect any sustained higher market for copper. Under normal conditions world production is exceeding demand. The futures market is nervous. Every rumor of a

(*Turn to page* 68, *please*)

Observations

By Joseph Geschelin

Large Volume

It came as a surprise to us to learn that the Ford Highland Park trim plant accounted for some $55- to $65-million of trim for the 1959 model year. If business stays good this plant should chalk up around $70-million of trim for '60 car. This surely places trim production in the realm of real big business.

CO_2 Threat

July issue of *Scientific American* had an interesting article on how this mad world is bent on extinction through the development of CO_2 from industrial plants, cars and trucks, and other devices that burn hydrocarbon fuels. There is a delicate balance in nature that has not taken industrial combustion processes into consideration. As a corolary we heard a radio program on "science" recently in which the commentator appeared to be obsessed with the smog problem. He urged the automotive industry to seek ways of eliminating CO_2 from motor car exhaust. Some one should tell him that when you find CO_2 in a high enough percentage of the exhaust it implies the nearest thing to perfect combustion that we have. Too, how can you eliminate it unless you find a plentiful source of fuel that does not contain hydrocarbons?

Powder Metals

According to the Eaton *"Engineering Forum"* of June 1959, the largest tonnage of powdered metal parts was recorded in 1954 with a total of 13,000 tons. By 1956 this rose to 50,000 tons and the forecast for 1959 is 55,000 tons. It is estimated that 1960 volume should be around 65,000 tons. The author of the article also estimates that over one million gears per day currently are being produced for all manner of industries. Powder metallurgy has come of age and has become an important factor in engineering design.

Fuel Injection

Recently we talked with a young inventor who has been working with a novel fuel injection system of his own devising. Working without backing he improvised a cylindrical housing which handles the timing and distribution of fuel to individual injectors located near the intake valves. This small unit, with an internal piston for timing, and an external cover with a connection to the throttle is mounted on the distributor drive for want of a better take-off on the experimental engine. The device also requires an air box and throttle; and a fuel pump capable of delivering fuel at 150-200 psi.

Quality Control

Despite the vast sums being spent by all manufacturers on quality control many customers insist that their cars as delivered have many shortcomings. By the same token we have reports that some dealers find it too difficult to make the fixes required on cars as delivered. The customer is right in between. Reliability should be a must if a particular car maker is to keep his customers happy. And dealers do not help at all by the attitude in evidence since the end of WWII. There is one dealer in the Detroit area whose service and attitude are so uncommon that he kept selling and kept his customers even though national sales of the car he handles dropped alarmingly during 1958. His customers never have to drive to his shop. He has the car picked up at the home or office and delivered to the same place. If a good customer is deprived of his car for several days the dealer provides a loaner free of charge. It doesn't sound like today but the fact is that this dealer is one of the most successful anywhere. We shall be glad to tell you who he is.

403 Midland Task Force

Late in August Chrysler revealed the story back of the development of the Valiant. It is a story of talented young engineers assigned to complete the design and test programs, supply production releases and tooling. It is a story of dedication to the job, pointing up the strength of large auto makers who have depth in engineering and manufacturing personnel. During the course of the meeting we learned that Chrysler had a small car—the Cadet—ready to roll some years ago. One of the features they toyed with was a V-6 engine—which they built and tested at the time. We felt it was a good thing to note for the record.

Galvanized Sheets

—have not had much of a role in motor car construction in the past. More recently some of this material has found its way into mufflers. But for 1960 there will be a considerable tonnage for certain makes of cars which will use the material for making rocker panels, wheelhouse stampings, and other vulnerable parts. This sounds simple but it has already revealed

(*Turn to page 74, please*)

News of the MACHINERY INDUSTRIES

New Broaching Equipment Uses More Than 30 Tools to Machine Inside Contour of Long Spar for Helicopter. Surface Finish of Workpiece Said to Be Better Than 50 Microinches

By Charles A. Weinert

New Lapointe Machine Broaches 24-Ft-Long Spars

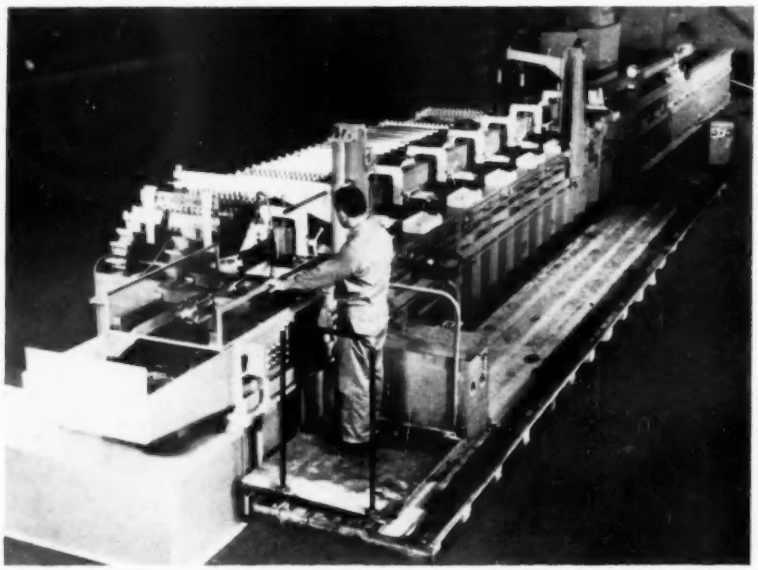
New broaching techniques, developed at The Lapointe Machine Tool Co., are responsible for broaching holes of lengths once thought impossible of doing by this method. The inside contour of a 24-ft helicopter spar is reported to have been successfully broached, using more than 30 broaching tools from initial roughing operation to final pass, and leaving a finish of better than 50 microinches.

The broaches are handled by a special conveyor system designed by Lapointe which places each broach in the correct position at the entering end. At the conclusion of the stroke, the broach is returned to the conveyor, ready for re-use on the next spar.

The machine for the 24-ft spar has a capacity of 50 hp and is 66 ft long. It is built in three sections on the "building-block" principle, so that more sections can be added for broaching a longer (44-ft) spar.

The machine is equipped with a traveling platform for the operator which traverses the entire length of the workpiece. This platform is electrically controlled and has automatic stops. Machine drive is electro-mechanical.

Workpiece is a hollow extrusion made of 4153 aluminum alloy and furnished by the Aluminum Co. of America. The blank, weighing 700 lb, is mechanically held in the machine by eight clamps. Approximately ⅛ in. of stock (or 80 lb) is removed from the internal surfaces by the broaching operations.



Lapointe 50-hp machine broaches the internal surfaces of a 24-ft-long helicopter spar. The workpiece is a hollow one-piece aluminum extrusion weighing 700 lb.

Lapointe engineers state this is the first time it has been possible to make an all-metal one-piece extruded blade to replace the conventional fabricated spar; and that the hole is broached straight within ±0.005 in. The uniform straightness, together with milling of the external surface, is said to produce a uniform thickness of the finished helicopter spar without other machining operations and hand scraping. Broaching is also said to decrease the possibility of strains in the finished prop.

At the present time a spar can be broached in 2½ hours, floor to floor time, although it is believed by company officials that this time will be improved with more experience in handling the new machine.

Manufacturing Process Promises Tool Savings

An unusual cutting tool "make-up" process, promising savings in initial and replacement tool costs, has been introduced by Spiral Carbide Tool Co., Detroit, Mich. The new method developed by Spiral employs a different approach to tool construction and eliminates a number of the machining operations ordinarily used in the manufacture of cutting tools.

With the Spiral process, basic tool configuration is incorporated into metal wafers pre-formed by stamping. These pre-formed wafers are then assembled on arbors in sizes and styles corresponding to tools produced by conventional

(*Turn to page* 67, *please*)

• • INDUSTRY STATISTICS • •

WEEKLY U.S.MOTOR VEHICLE PRODUCTION

As reported by the Automobile Manufacturers Association

Make	Weeks Ending Sept. 19	Weeks Ending Sept. 12	Year to Date 1959	Year to Date 1958
PASSENGER CAR PRODUCTION				
Total—American Motors	4,668	4,421	279,323	127,560
Chrysler	565	232	51,129	36,319
De Soto	285	174	34,498	24,921
Dodge	3,813	1,115	114,434	74,926
Imperial	705	489	13,691	8,456
Plymouth	3,739	1,706	313,834	265,633
Total—Chrysler Corp.	9,107	3,716	527,586	410,255
Edsel	221		27,052	8,503
Ford	11,009	867	1,088,020	655,600
Lincoln	197	132	19,078	17,714
Mercury	1,558		108,079	84,949
Total—Ford Motor Co.	12,985	999	1,242,229	766,766
Buick	4,347	2,676	169,308	156,190
Cadillac	1,438	278	107,997	90,958
Chevrolet	15,722	2,744	1,143,751	889,163
Oldsmobile	6,179	3,802	288,355	210,970
Pontiac	6,101	3,970	312,580	141,905
Total—General Motors Corp.	33,787	13,470	2,021,991	1,489,186
Total—Studebaker-Packard Corp.	2,109	2,519	109,648	23,751
Checker Cab			2,839	2,120
Total—Passenger Cars	62,656	25,125	4,183,616	2,819,638
TRUCK AND BUS PRODUCTION				
Chevrolet	5,282	3,937	265,706	188,857
G. M. C.	801	366	62,902	42,683
Diamond T	82	52	4,298	3,902
Divco	80	64	2,676	2,016
Dodge and Fargo	1,134	844	56,749	39,924
Ford	5,923	1,686	244,847	150,892
F. W. D. Corp.	28	20	771	933
International	2,942	2,318	105,994	66,271
Mack	390	311	12,915	10,782
Studebaker	159	196	10,081	6,775
White	440	371	14,503	11,791
Willys	2,534	1,927	84,154	61,101
Other Trucks	70	65	2,723	2,233
Total Trucks	19,865	12,157	868,319	588,160
Buses	36	32	1,698	2,446
Total—Motor Vehicles	82,557	37,314	5,053,633	3,410,244

NEW FOREIGN CAR REGISTRATIONS

JULY

1959		1958	
Volkswagen	10,348	Volkswagen	6,798
Renault	8,439	Renault	4,040
English Ford	3,928	English Ford	2,731
Fiat	3,766	Fiat	2,065
Opel	3,447	M. G.	1,774
Simca	3,426	Simca	1,653
Hillman	2,655	Triumph	1,622
Triumph	2,241	Vauxhall	1,611
Vauxhall	1,983	Volvo	1,542
Austin Healey	1,841	Hillman	1,471
All Others	14,064	All Others	8,400
Total	56,138	Total	33,707

First Seven Months

1959		1958	
Volkswagen	64,661	Volkswagen	47,198
Renault	46,847	Renault	21,722
English Ford	26,014	English Ford	16,439
Opel	22,811	Fiat	9,871
Fiat	22,171	M. G.	9,383
Simca	22,076	Hillman	9,339
Hillman	17,196	Simca	8,825
Triumph	13,607	Triumph	8,674
Vauxhall	12,954	Vauxhall	7,886
Volvo	11,157	Opel	7,149
All Others	86,087	All Others	46,909
Total	345,581	Total	193,395

RETAIL CAR SALES BY PRICE GROUPS*

June, 1959

Price Group	Units†	% of Total	Dollars	% of Total
Under $2,500	156,261	29.63	$361,779,015	24.82
$2,501 to $3,000	286,588	54.33	772,597,850	53.02
$3,001 to $3,500	39,831	7.55	127,726,864	8.76
$3,501 to $4,500	29,569	5.61	112,354,081	7.71
Over $4,500	15,174	2.88	82,936,519	5.69
Total	527,423	100.00	$1,457,394,329	100.00

*—Calculated on basis of new car registrations, as reported by R. L. Polk & Co., in conjunction with advertised delivered price at factory of four door sedan or equivalent model. Does not include transportation charges or extra equipment.

†—New registrations of American made cars only. Does not include imported foreign cars.

1959 NEW REGISTRATIONS

Arranged in Descending Order According to the Six Months 1959 Totals

NEW CARS

Make	July 1959	June 1959	July 1958	Seven Months 1959	Seven Months 1958
Chevrolet	139,412	145,797	117,243	895,040	777,256
Ford	136,266	140,290	86,219	870,212	587,084
Pontiac	36,594	37,570	17,883	237,532	140,291
Plymouth	37,537	40,434	36,070	232,746	238,015
Oldsmobile	32,354	34,550	25,366	227,025	193,507
Rambler	36,717	36,399	18,065	213,321	96,651
Buick	20,581	21,297	18,129	155,333	159,706
Mercury	13,599	13,298	12,769	90,490	83,721
Cadillac	11,719	11,863	10,395	87,506	78,483
Dodge	14,080	15,412	11,601	86,667	60,350
Studebaker	12,454	12,154	3,476	80,875	24,450
Chrysler	6,023	6,463	5,284	37,941	37,742
Edsel	3,539	3,774	2,707	27,759	24,764
De Soto	4,404	4,319	3,859	27,404	30,385
Lincoln	1,952	2,005	1,788	16,982	17,277
Imperial	1,389	1,488	1,148	10,456	9,597
Misc. Domestic	227	492	556	2,998	3,780
Foreign	56,138	57,211	33,707	345,581	193,395
Total—All Makes	564,985	584,816	406,265	3,645,886	2,776,454

NEW TRUCKS

Make	July 1959	June 1959	July 1958	Seven Months 1959	Seven Months 1958
Chevrolet	31,279	30,779	23,431	198,831	146,054
Ford	26,166	25,893	18,143	163,097	116,775
International	10,499	9,909	7,461	59,746	50,653
G. M. C.	6,726	5,908	4,870	41,861	30,469
Dodge	4,925	5,049	3,313	32,515	22,227
Willys Truck	1,547	1,448	973	10,097	7,201
White	1,251	1,473	996	8,982	6,941
Mack	1,204	1,270	1,222	8,324	6,815
Willys Jeep	789	837	600	5,016	3,400
Studebaker	616	553	405	3,793	2,667
Diamond T	336	235	276	1,610	1,678
Brockway	80	101	74	633	470
All Others	3,529	3,459	2,761	23,785	17,098
Total—All Makes	88,949	86,914	64,525	558,290	412,446

Source: Based on data from R. L. Polk & Co. All rights reserved. Re-use prohibited.

Report from the FARM EQUIPMENT INDUSTRY

Milwaukee Hosts SAE National Farm, Construction and Industrial Machinery Meeting, Sept. 14th thru Sept. 17th

THE Society of Automotive Engineers, with the cooperation of the SAE Milwaukee Section, sponsored last month's National Farm, Construction and Industrial Machinery Meeting which was held in Milwaukee's Public Auditorium.

The four day program included production forums, engineering displays, and technical sessions. Added features included the Powerama Picnics which reviewed past and future motor vehicles, and a luncheon with M. B. Rojtman, president of J. I. Case Co., as guest speaker.

Technical Papers Presented

Approximately 25 papers were presented during technical sessions held Tuesday, Wednesday, and Thursday. Experts gave some of the latest information on such subjects as soils compaction, rippers vs. powder blasting, economics of future farming, what's new in transmissions, Russian progress in agricultural, design and rating of cranes, power take-off drive lines, and hydraulic lift systems and implement hitches. Extracts of some of the papers are presented herewith:

Servo Booster System for Positioning Control of Implements

By T. I. Monroe
ROSS GEAR AND TOOL CO.

WHILE the use of hydraulic power for implement control is common practice and the use of servo boosters for steering control is also well known, there appears to have been little work done on applying the hydraulic servo booster to implement control.

Most power devices presently in production on agricultural and construction equipment use open loop hydraulic systems consisting of a hand control valve, a power cylinder and a pump. The control valve is usually mounted near the operator for convenient manipulation. As cylinder locations are remote from both the control valve and the pump, numerous long hydraulic lines are often required. The existing control system is one of UP or DOWN with hap-hazard "nudge" control for intermediate positioning.

The servo booster unit is installed similarly to the conventional hitch lift cylinder, in that one end is mounted to the frame and the other to the hitch arms. The hydraulic supply and return hoses are coupled to the two ports on the booster unit. A flexible cable control assembly is attached to the booster on one end and to the hand lever at the other end. A cable bend of approximately 90 degree is required at the booster end. A traction boost over-ride control may be provided by a simple linkage from the draft control spring to the cable conduit. Any deflection of the control spring applies an input signal to the conduit tending to lift the implement. A relaxation of the control spring moves the booster and the implement in the opposite direction. Similarly, automatic implement height control can be easily obtained by use of a ground level sensing finger which actuates the push-pull cable. This may be particularly desirable for sickle-bar mowers and the like operating on rough terrain.

Accurate manual positioning of the implement height is easily accomplished by adjusting the hand control lever to the desired position. An adjustable stop on the hand lever bracket provides precise re-positioning to any pre-selected height.

Application of a booster unit such as mentioned here opens numerous opportunities for the implement engineer. For example, it is possible that with proper design a single booster unit could be adaptable interchangeably for use with integral or trailing implements. Also, the incorporation of quick disconnect hoses and clevis points would provide for easily applying the power package to the implement desired.

As a further advantage, the unit can be easily serviced as a package replacement with a minimum of down-time and labor. Although maintenance and service requirements for this type of unit are usually negligible, this may offer advantages for some operators.

Hydrostatic Transmissions

By P. C. Mortenson
VICKERS INC.

THE hydrostatic type of transmission transmits power by means of a fluid under pressure acting upon a moving piston. Energy is imparted to a fluid by a positive displacement pump, is transmitted to a positive displacement motor, where it is converted into useful work.

The pump is driven by the engine, or by any other type of prime mover. This portion of the transmission is identified as the power input end. Fluid leaving the input end is delivered under high pressure to a hydraulic motor which delivers power through its output shaft.

Reasons for interest in hydrostatic

transmissions are many, several are explained as follows:

A. The input end can be designed to deliver an infinitely variable quantity of fluid. Fluid thus delivered provides variable output speed that can be changed from maximum to zero speed in a truly stepless manner. The change in speed is absolutely smooth.

B. It is fully reversible from full rpm in one direction, down to zero, and then to full rpm in the other direction.

C. A hydrostatic transmission, at zero delivery of the pump, does not creep.

D. Dynamic braking of the vehicle is an inherent feature of a hydrostatic transmission.

E. Throughout the entire torque range, a vehicle incorporating this type of transmission will operate at a constant speed, independent of whether it is moving up hill, down hill, or pulling light or heavy loads. If a drawbar pull is suddenly removed, the vehicle speed remains practically unchanged.

Several drawbacks are common in hydrostatic transmissions.

A. Noise can become a problem when the units are required to operate over wide speed and pressure ranges.

B. To obtain high efficiencies, precision type materials and workmanship are required.

C. Hydrostatic units may be heavier in weight and larger in bulk than mechanical transmissions for a given hp rating. ■

News of the Machinery Industries

(*Continued from page* 64)

methods. Cutting tips, either carbide or HSS, are placed into edge cut-outs, and the entire assembly is brazed together. Cutting tips are then sharpened by conventional cutter grinding methods.

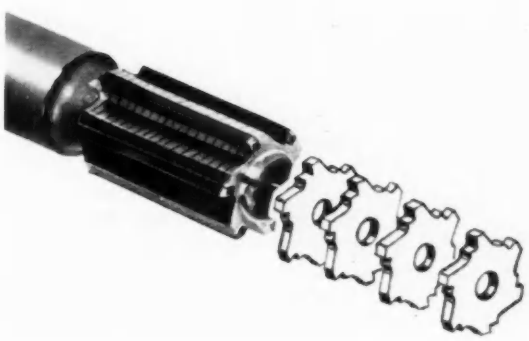
In making the announcement, Spiral Carbide Tool Co. officials say the company will not only manufacture and market its own tools made by this process, but will, in addition, license other tool manufacturers interested in the process. (See illustration below.)

Heald Stock Program Quickens Delivery

Faster delivery of popular sizes and types of standard precision finishing machines has been made possible by a program initiated by The Heald Machine Co.

Field tested for several years, the stock machine program has been expanded to include eight models of Bore-Matics, nine models of internal grinders, five rotary surface grinder models, and two tool sharpening machines. Some are completed machines ready for final painting, while others are semi-finished machines that can be completed from stock parts.

Delivery ranges from as little as several days to as much as several weeks, depending upon individual requirements. Stock machine sales now account for about 20 per cent of Heald's sales volume, according to Raymond A. St. John, Heald vice-president and general sales manager. ■



In the Spiral cutting tool "make-up" process, preformed metal wafers are assembled on arbors in sizes and styles corresponding to standard cutting tools. Cutting tips, either carbide or HSS, are placed into edge cut-outs, and the entire assembly is then brazed together.

A total of 31 million motor trucks have been produced in the U. S. since the beginning of the industry.

●

More than 600,000 trucks and buses were scrapped in the U. S. last year, compared with factory sales of 664,046.

●

There are 59,000 truck fleets of 10 or more vehicles in operation throughout the U. S.

●

Scheduled helicopter airlines registered new gains during 1958, carrying 228,000 passengers, an increase of 54 per cent over the 148,000 passeners transported the previous year. In 1954, only 9000 passengers were carried.

●

An aircraft company has developed a new die quenching process that cuts tooling cycling time from 10 minutes to less than one minutes. The new process is used in the rapid forming of tough heat-resistant alloys.

●

Missiles carried by just one of today's interceptors cost more than an interceptor plane cost 15 years ago.

Motor Products Buys Two Supply Firms

Motor Products Corp. has purchased two automotive supply firms in Broken Arrow, Okla.,—Braden Winch Co. and Arrow Gear Co. The two firms, fifth and sixth of Motor Products' recent acquisitions, make truck and tractor winches, gear boxes, special transmissions, hoists, speed reducers, and power take-offs. The two will be operated as Motor Products divisions.

METALS

(*Continued from page 62*)

strike termination weakens the market which has declined on such extraneous factors as a rise in the bank rate.

The firm stand taken by the steel makers against any further wage increases with inflationary effect no doubt has strengthened the attitude of the copper producers. They have the further conviction that higher prices for copper will result in definite loss of markets. They want no repetition of the 1956 markets and subsequent debacle.

Zinc in Relatively Sound Position

The August figures of the Zinc Institute should cause no alarm in spite of an increase in stocks of 10,000 tons during the month, which brought the total at the end of August to 192,000 tons. However, this was substantially less than a year ago, when they totalled 251,500 tons.

Production was down 3400 tons, reflecting strikes at some plants, but not all. Shipments held up surprisingly well, considering that the steel strike had been in effect for nearly a month, with elimination of demand from the galvanizers who constitute the largest market for zinc. Shipments totalled 59,800 tons, a slight decrease from July but much better than shipments three years ago during the 1956 steel strike.

Analyzing the figures more closely, stocks of Prime Western accounted for all the increase. But stocks of Special High Grade and High Grade metal showed a decrease, although a seasonal increase was normally expected. This arose from excellent demand from the diecasters for metal to supply their products for the new car models. A leading producer declared he could sell all the High Grade that could be produced.

AUTOMOTIVE INDUSTRIES KEEPS YOU INFORMED

Price Advanced For High Grade

It was therefore no surprise that the premium on High Grade was raised ¼ cent to 1½ cents over Prime Western. It is quite in the cards that it will be again advanced to the old 1¾ cent differential. While an advance in Prime Western from 11 cents to 12 cents is widely anticipated, such a step would probably await the ending of the steel strike.

The price situation abroad continues contradictory, where zinc sells about 1¾ cents higher than lead, just the reverse of the domestic markets. To import zinc after paying tariff, insurance, and freight, would probably require a market here of about 12¾ cents a pound. It is likely that zinc is headed for this figure before winter. This appears to be in line with the opinion in Washington, where Secretary Seaton is quoted, "With the settlement of the steel strike, an adjustment upward in zinc prices is indicated."

Aluminum Production Runs High

July established a new all-time monthly record for aluminum of over 179,000 tons and a total output of primary metal or the seven months of 1,121,600 tons. This was nearly 30 per cent more than the output for the same period last year. Producers stocks which were 175,000 tons when the year began had fallen to 80,000 tons by July. This record is the more striking because it has all arisen from commercial demand unaided by any substantial puts to the Government which accounted for 323,000 tons in 1958.

While the demand has increased progressively to a greater extent than was anticipated earlier in the year, it is probable that the high shipments in June and July represented in some part a buildup against a strike that did not materialize. There was probably further hedging against a price increase that would accompany a wage increase. This likewise did not follow, nor is it likely to until a wage settlement is made, for which negotiations will not begin until the steel strike is ended.

It is therefore probable that third quarter figures may not be as pleasing as the second quarter. Consumers are quite well supplied with metal and will be in no haste to lay in more inventories.

Nevertheless, it appears that the primary producers may well exceed their 1959 target of production of 1,900,000 tons. It could be closer to 2 million tons. The threat of a serious strike can be virtually dismissed, and in all likelihood a settlement will be made along the same lines as steel. The industry's current operational rate is around 91 per cent of available capacity, with commercial shipments exceeding production in July.

Lead Market Dull

While the lead price was raised to 13 cents in late August, making it a full 2 cents higher than zinc, demand is not strong at the new quotation. Apparently consumers are well supplied. Shipments dropped sharply in July and August, indicating that users had anticipated the work stoppages at the lead mines and smelters and had provided for most of their September needs in the second quarter. Imports of lead declined 25 per cent from last year during the first seven months of 1959. Lead in Canada is quoted at 10¾ cents a pound, f.o.b mine.

There is no unanimity in the zinc and lead trade over measures to be taken to improve conditions. Miners want quotas tightened and higher tariffs. Smelters on the other hand declare that prolongation of quotas will jeopardize the competitive position of the domestic custom smelting business, and call for their elimination and duties not so high as to shut out needed foreign supplies. But it now appears that the miners will find a more sympathetic ear at Washington. ■

Pontiac Adds Ventura Series

(*Continued from page* 45)

it is fitted with a four-barrel carburetor.

Then there are two premium-fuel engine setups for use with Hydramatic drive, both having a compression ratio of 10.25 to 1. For Catalina, Ventura, and Star Chief the engine is fitted with a 1½-in. two-barrel carburetor. For Bonneville, the same engine is fitted with a four-barrel carburetor. The Bonneville engine of this group also is available as optional equipment for Catalina, Ventura, and Star Chief series when Hydramatic drive is specified.

Supplementing the engine versions mentioned above are two special packages. One of these is a regular fuel "economy" engine which is available in all series with Hydramatic drive. With compression ratio of 8.6 to 1, it is fitted with a 1¼-in. two-barrel carburetor and features a high efficiency camshaft. This option also takes special rear axle ratios as follows: 2.69 to 1 for Catalina, Ventura, and Star Chief; 2.87 to 1 for Bonneville.

The second special package is a premium fuel version for all series, with either manual shift or Hydramatic drive. It has a compression ratio of 10.75 to 1 and is fitted with three, two-barrel carburetors.

Although the basic 389 cu in. engine remains substantially the same, it may be noted that pistons for premium fuel engines, with their higher compression ratios, are notched on the dome to provide increased valve clearance. Some improvements have been made in skirt contour and skirt lubrication.

Both two-barrel and four-barrel carburetors have been improved, generally by providing better operation during warm-up as well as with improved performance following cold starts. Other new engine details include: a disposable fuel filter; a new oil pump; a new intake manifold so designed as to improve fuel distribution as well as to accommodate both the small and large two-barrel carburetors; and a new rear main bearing oil seal.

The cooling system concept has been changed. Pontiac now has a divided chamber water pump so designed as to distribute water equally to each cylinder bank.

Improvement in ride and handling is said to result from some changes made in the rear suspension system. Large rubber bushings are located at the pivot point of the rear axle lower control arms. The upper control arm has been elevated by one inch, placing the roll center of the car closer to the center of gravity. Shock absorbers are new, and feature a nylon-sleeved control piston and a high viscosity index fluid which is practically unaffected by temperature changes.

HydraMatic drive with its slimmer case and a narrower oilpan aids in reducing the size of the hump in the front compartment. Rerouting of oil cooler pipes and the addition of rubber couplers aids in isolating transmission vibrations.

Clutch linkage for the manual shift transmission has been improved to conserve driver effort and provide a more positive "feel" in shifting. In addition, both standard clutch and brake pedals have been lowered by ¾-in.

The power steering mechanism has been improved by imparting some added strength and by redesign of the upper thrust bearing to permit oil passage through the bearing case assembly. Servicing of the filter screen and valve assembly of the steering gear pump has been facilitated by reversing the fittings.

Single speed electric windshield wipers are standard on Catalina and Ventura models, while the other models in the line have two-speed windshield wipers. ■

AUTOMOTIVE INDUSTRIES . . .
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MANUFACTURING

Defense contractors must expect closer scrutiny of their cost estimates by the Government. It's part of a new Pentagon program to cut frills, get more hardware for the defense dollar. The U. S. Comptroller General has complained to Congress and to the Pentagon that too many contractor cost estimates are sloppily or incompletely prepared.

A long-awaited Congressional look at the problems resulting from antiquated and unrealistic Federal depreciation rules now is set for Nov. 30. The taxwriting House Ways and Means Committee has named 11 leading tax authorities to join in a panel discussion on depreciation problems on that date. The depreciation discussion is one of series of similar panels on tax problems that will extend over a five-week period beginning November 16.

Sales by the manufacturer of certain brake lining segments for cars and trucks are taxable under the U.S. automotive excise tax laws. Revenue Ruling 59-290, issued by the Internal Revenue Service, describes the tax status of this type of brake lining. In the IRS view, the brake linings are automotive parts or accessories because they are cut to length for applications to automobile or truck brakes. The manufacturers' sales of the linings thus are subject to the excise tax, despite the additional work required of the buyers.

The Government refuses to be panicked by the steel strike. Unions, attempting to impose a Government-dictated settlement of the strike, have been attempting to persuade Washington that defense production is being "hampered" by the strike.

The All-New Chevrolet Corvair

(*Continued from page 37*)

each end. It is driven through a splined connection off the transmission output shaft, the latter passing through the pinion shaft. To facilitate manufacturing the hypoid gear and shaft are made separately, then assembled with a press fit.

The hypoid ring gear, 6¾-in. diameter, is bolted to the two-piece cast Armasteel differential housing which is mounted on tapered roller bearings. Two differential pinions mate with the differential side gears in conventional fashion, the latter driving the axle shaft universal joints through splines. Lubrited thrust washers are used on both the pinions and side gears.

Standard rear axle ratio is 3.55 to 1 with either type of transmission, an optional ratio of 3.89 to 1 being offered with the manual shift transmission. When used with the latter the differential carrier and transmission share the same lube supply. However, when the automatic drive is specified, each unit has its own lube supply.

The automatic drive has the operational features of Powerglide but is designed specifically to suit the Corvair drive train. It has an aircooled three-element torque converter and a two-speed planetary gear set. When installed in the Corvair it fits in the same space provided for the manual shift transmission, the converter being attached to the flex plate. The input shaft from the converter is assembled through the hollow pinion shaft and transmission output shaft.

While power flow is the same as in Powerglide, it differs by the employment of an 8-active face plate clutch for reverse operation to provide or greater durability. This aids in space economy by eliminating the servo. The transmission case is of aluminum, contributing to the low weight increase of 53-lb for this option.

The three-element torque converter is of special design with an all-welded cover. Special provision is made for driving the transmission front pump, due to the remote location of the torque converter. Here a separate shaft is splined to the converter front cover and runs through the hollow input shaft to the pump. The front pump shaft also serves as the bearing support for the input shaft under the high clutch.

In general, many of the Corvair automatic drive parts are either the same or modified versions of production Powerglide or Turboglide drives. Among these are: most of the clutch components; front and rear oil pumps; governor; planetary gears; and some valve parts.

FRONT SUSPENSION

All front suspension components are assembled as a unit with the front suspension cross-member. Spherical joints and anti-dive suspension geometry are featured. Upper control arms are similar in design to those on Chevrolet cars but smaller in size and of lighter gage metal. Lower control arms are of two-piece construction, consisting of a stamped, flanged channel-section beam; and a smaller bar-like strut for rigidity in the horizontal plane. The two are bolted together near the outer end while the inner end is mounted on two rubber bushings. The inner end of the strut is threaded to provide front caster angle adjustment by varying its effective length.

In contrast to conventional practice, the lower spherical joints are inverted so the ball studs carry the chassis weight in tension. This makes possible the use of a shorter steering knuckle for unsprung weight savings.

MORE ON AXLES

Corvair features the swinging axle type independent rear suspension with the entire powerplant and final drive mounted to the sprung mass of the car. Axle shafts are individually driven through U-joints on each side of the differential. Rugged box-section control arms support the wheel assembly, reacting against the suspension coil springs and shock absorbers. Control arms are mounted in a semi-trailing attitude so that the projected pivot axes pass through their respective axle shaft U-joint centers.

With swinging axles it is necessary to take into account some special factors of geometry. Toe-in is arranged to increase positively as the suspension moves from its design position. This is important because of the greater weight carried at the rear, the toe-in arrangement thus contributing to a desirable understeer geometry. Adjustment for rear toe-in, in production or in the field, is made by shimming the powerplant mounts so as to move the entire assembly fore or aft.

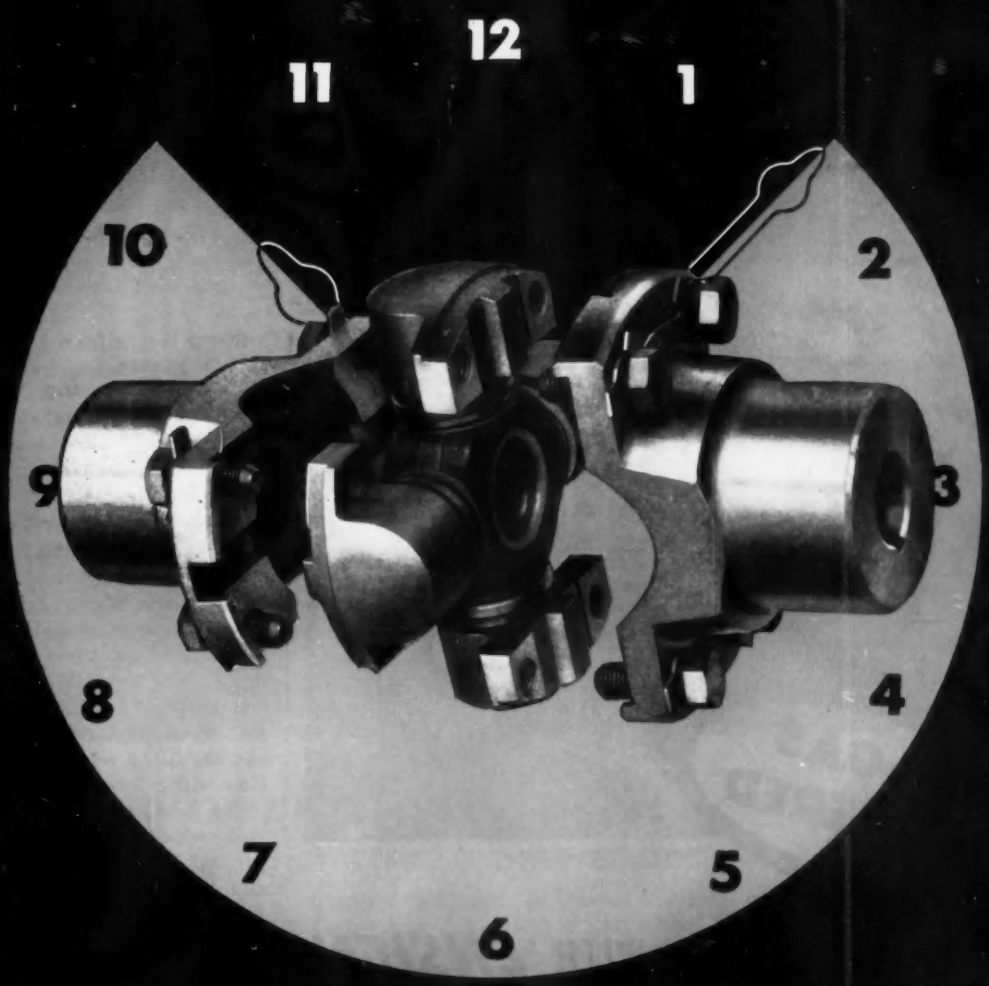
Steering gear is a manual type, recirculating ball unit with a ratio of 18 to 1; overall steering ratio is 23.5 to 1. The gear housing, of aluminum, not only conserves weight but permits machining of the pitman shaft bearing directly in the parent metal. The steering shaft is made in two sections, connected with a rigid coupling. Steering linkage is quite similar to that of conventional cars, except for differences in geometry due to the short wheelbase and narrower tread.

BRAKES AND WHEELS

Corvair brakes are of duo-servo type, 9-in. diameter with linings 1.75-in. wide. Actual effort distribution is 46 per cent on front brakes, 54 per cent on the rear, this being accomplished by using ⅞-in. diameter wheel cylinders at the front, 15/16-in. at the rear. Slotted wheel discs aid in brake cooling, the nominal 9-in. brake drums used in conjunction with 13-in. wheels, providing extra air flow.

Wheels are 13-in. with 5.5-in. rims and are of conventional design. Tires are 6.50 x 13 of Tyrex cord and tubeless type. Recommended inflation pressure is 15-psi for front tires, 26-psi for the rear. ■

FIFTEEN MINUTE SERVICING



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Dodge Trucks

(*Continued from page 43*)

charged C-175, which provides 175 hp. 464-cu in. displacement, and 406-lb-ft torque; the NH-180 with 180 hp. 672-cu in. displacement, and 504 lb-ft torque; the NH-195 with 195 hp, 672-cu in. displacement, and 533 lb-ft torque; and the NH-220 with 220 hp, 743-cu in. displacement, and 605 lb-ft torque. The NH engines are naturally aspirated.

Heavy-duty transmissions include: the new 5-speed New Process 541; the Clark 301-V; the Spicer 6000 Series; Fuller 8 and 10-speed units; and new auxiliary transmissions. The 6-speed Torqmatic, available on 361-cu in. engines in 500, 600, and 700 models, has a built-in torque converter hydraulic retarder.

Frames, fabricated from heat-treated chrome-manganese steel, are standard on all 800, 900, and 1000 models.

A new 13-in. 2-plate clutch is used with the 413-cu in. 4-barrel carburetor gasoline engine. A new 14-in. 2-plate clutch is standard with the NH Diesel engines, and a 15-in. single-plate clutch is standard with the C-175 Diesel engine.

An oil cooler is standard on all 413-cu in. gasoline engines, on C-175 and NH-220 Diesel engines, and on the 204-hp, 361-cu in. V-8. It is available on the NH-180 and the NH-195 Diesel engines.

Automatic radiator shutters are standard on Diesel models and available for heavy-duty gasoline units.

Sweptline half-ton pick-up offer two choices in engines—a 120-hp 6-cyl or a 200-hp V-8.

Sweptlines are available in half, three-quarter, and one-ton models. They have load capacities from 59.7 to 84 cu ft. The Town Panel is offered with either the 6-cylinder or the V-8 engine in a wheelbase of 108 in.

The Town Wagon can carry up to eight passengers in its three seats. With its two rear seats removed, the Town Wagon provides 155 cu ft of load space. Half-ton and three-quarter-ton Power-Wagons are being offered for the first time with a Sweptline pick-up body.

The new line of Power-Wagons also includes conventional half-ton through 2-ton models featuring 6 and 8-cylinder engines and gross vehicle weights to 20,000 lb.

Thirty stake and platform models are offered in nine basic categories from half-ton through 2-ton. Eight wheelbases from 116 to 171 in. are available, with maximum gross vehicle weights ranging to 19,500 lb.

Two forward-control chassis—the 1-ton and the 1½-ton—are available with 6 or 8-cylinder engines. The walk-in delivery units feature payload capacities to 15,000 lb. ■

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Minneapolis-Moline LP-Gas Powered Tractor Model 445.

--OEM* EQUIPPED WITH ENSIGN

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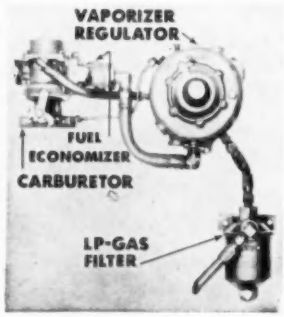
*OEM *means "Original Equipment Manufacturer." It means that the manufacturer of this tractor has chosen Ensign carburetion as standard equipment.*



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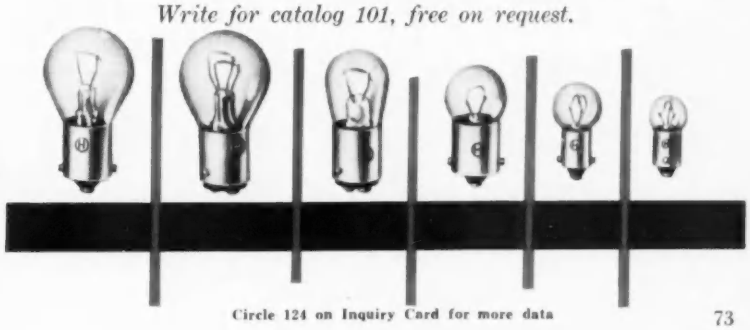

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OBSERVATIONS

(*Continued from page* 63)

some problems. For one thing, galvanized sheet has never been required for deeply drawn parts. And some of these parts require deep drawing quality. What is even more of a problem is the spot welding of such material. The welding electrode picks up zinc which, in turn, alloys with copper to form brass. Welding tip life is reduced and frequent dressing becomes necessary. We understand, confidentially, that two different avenues of approach have been proposed: one is to produce "differentially-coated" stock in which one side has a thinner coating; the other is to produce sheet coated on only one side. It will be interesting to see how cooperative research will tackle both major problems. ■

British Farnborough Show

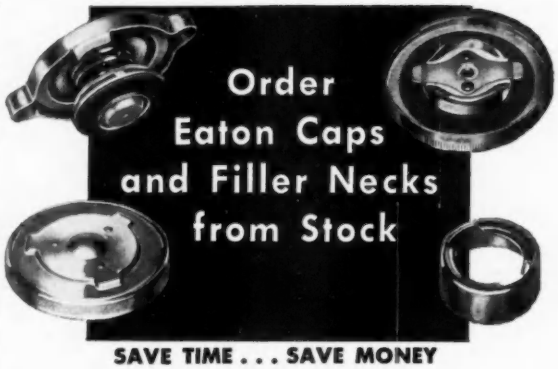
(*Continued from page* 27)

engine which, fitted with the Solar fully-variable reheat system, has a total output of 33,000 lb thrust. In its standard production form, the Mark 201 (B.01.7) has a rating of 17,000 lb thrust.

Another revelation by Bristol Siddeley was the Gamma multi-chamber rocket engine, whose four combustion chambers are gimbal-mounted to swivel under hydraulic control for vehicle guidance. The 700-lb unit develops a thrust of 16,400 lb at sea level, rising to over 19,000 lb beyond the earth's atmosphere.

Rolls-Royce displayed its new RB.141 by-pass jet of 14,300 lb thrust whose initial tests will start in October. It has been specified for later versions of the Sud-Aviation Caravelle, and production engines will be available early in 1962. Shown also by Rolls-Royce was the 13,220-lb thrust RB.146. It is the latest of a long line of Avon turbojets and is intended for advanced supersonic fighters. ■

AUTOMOTIVE INDUSTRIES Goes into Leading Plants in the Automotive and Aircraft Industries



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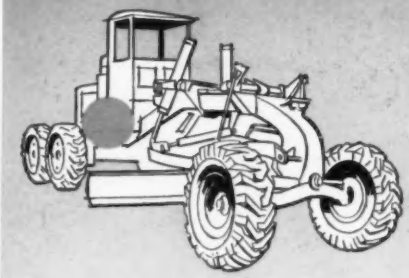
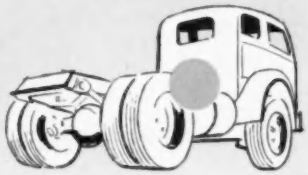
EATON MANUFACTURING COMPANY
STAMPING DIVISION • 17877 St. Clair Avenue • Cleveland 10, Ohio

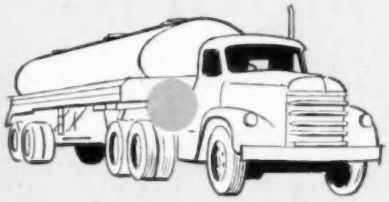
Circle 126 on Inquiry Card for more data



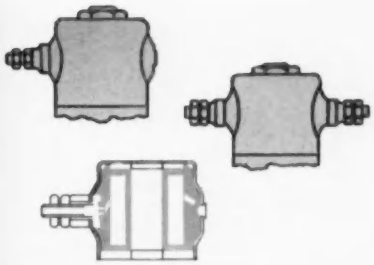
Automatic diesel governor control. To improve brake life and save fuel this motor grader uses a Skinner V5, three-way, normally open solenoid valve to relieve pressure in the hydraulic actuated engine governor. When the brakes are applied, the valve is energized by a pressure switch on the master cylinder causing the valve to close and bypass oil from the governor cylinder which reduces the pressure and throttles the engine.



Saddle tank operation. Energized by a standard dash-mounted toggle switch, a Skinner valve makes fuel level readings and tank switching a one-step, push-button operation. Valve reduces accident hazard by preventing driver's attention from being diverted; saves on labor and materials by eliminating fuel piping.



Propane and butane fuel cut-off. On trucks using liquid propane or butane fuel, Skinner V61 solenoid valves are used as a safety device to automatically shut off the tanks from the fuel system when the vehicle is not in operation. The valve is installed on the line ahead of the vaporizing unit and is energized by the ignition switch. Skinner valves for this application are approved by the Underwriters' Laboratories.



Skinner solenoid valves are available with single or double automotive terminals; specially designed automotive housings with potted coils (coil, housing leads and flux plate are potted with a compound to make them vibration-proof and moisture resistant); and waterproof molded coils that operate in all types of weather, under the severest conditions—even under water.

Additional features of Skinner automotive valves include: stainless steel internal parts; soft synthetic, long-lasting inserts that provide bubbletight sealing; spring-loaded plungers; mounting in any position; orifice seats with radius with well-rounded contact area and high finish for long insert life. All valves are built to the highest UL standards for the convenience and safety of the automotive industry.

Skinner solenoid valves help solve automotive problems like these

SKINNER SOLENOID VALVES ARE DISTRIBUTED NATIONALLY. For complete information, contact a Skinner Representative listed in the Yellow Pages or write us at Dept. 330.

SKINNER ELECTRIC VALVES

THE CREST OF QUALITY

SKINNER ELECTRIC VALVE DIVISION
NEW BRITAIN CONNECTICUT
105 EDGEWOOD AVENUE

1959
2,040,000 TONS
CAPACITY
McLOUTH STEEL
25th progress year
We are continuing to grow and produce better steels for the product you make today and the product you plan for tomorrow.

McLOUTH STEEL CORPORATION

HOT AND COLD ROLLED SHEET AND STRIP STEELS

Detroit 17, Michigan

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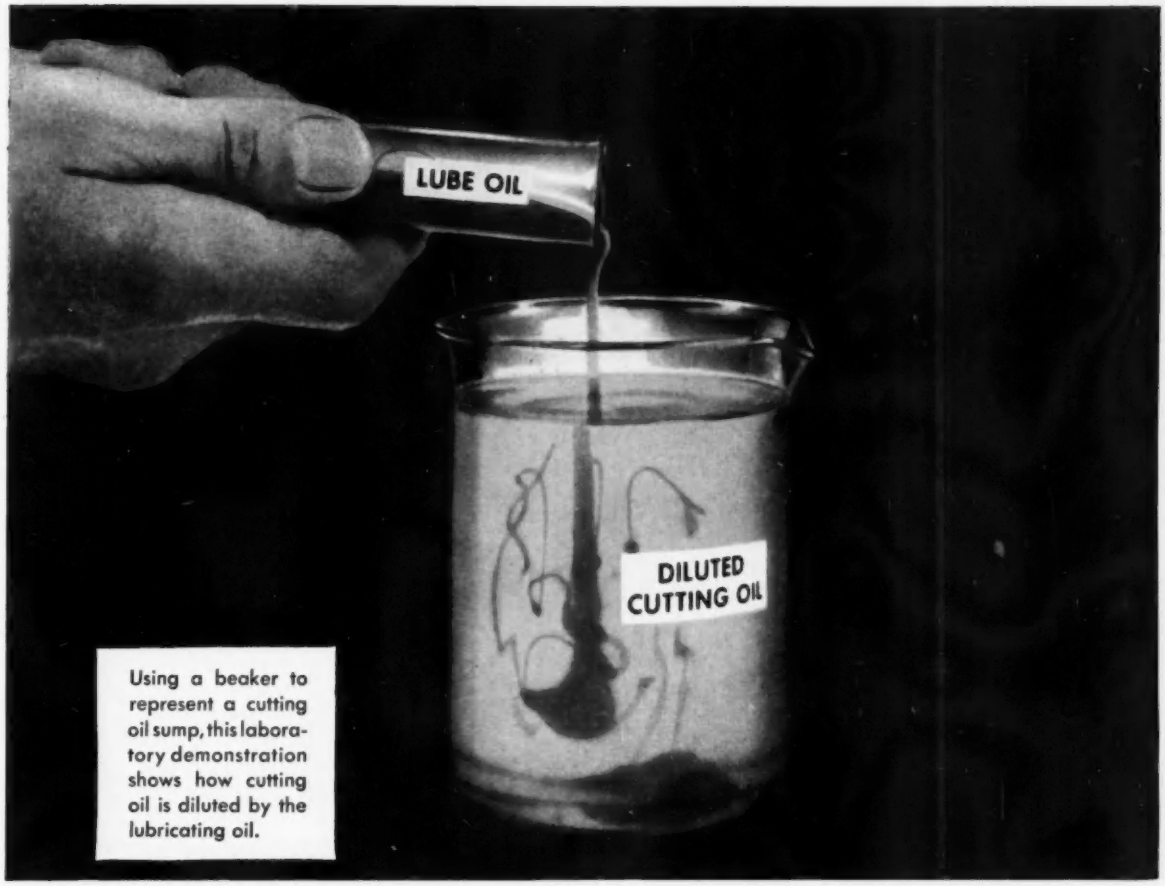


Using a beaker to represent a cutting oil sump, this laboratory demonstration shows how cutting oil is diluted by the lubricating oil.

Diluted cutting oil can cut output 33%

No matter how careful your lubricating techniques, you still can't stop lube oil from leaking into the cutting oil sump on 70% of automatic screw machines. As cutting oil is diluted, it loses strength—ingredients that make it efficient become less and less effective. The natural consequence is shortened tool life, more downtime and a higher percentage of rejects.

Texaco Cleartex can end this problem forever. All you have to do is use Cleartex for both cutting *and* lubrication . . . and watch your production rise. The exceptional chemical stability and load-carrying ability of the Cleartex series make them equally suitable for use as cutting oils, lubricants and hydraulic fluids. (70% of all automatic screw machines can benefit from the "Cleartex Cure!")

TAKE THE CLEARTEX CURE SOON!

Write today for your copy of Texaco's new booklet—"Cleartex in Automatic Screw Machines." This new illustrated guide will fill you in on the details, show you where you may be losing profits and how to avoid it . . . Or contact your local Texaco Lubrication Engineer soon for an authoritative survey of your automatics. Just call the nearest of more than 2,300 Texaco Distributing Plants, or write to Texaco Inc., 135 East 42nd Street, New York 17, New York. Dept. AI-13.

Tune in: Texaco Huntley-Brinkley Report, Mon.-Fri.-NBC-TV

LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

(PARTS, INVENTORY, PRODUCTION, DOWNTIME, MAINTENANCE)

Circle 129 on Inquiry Card for more data

Chevrolet Passenger Cars

(*Continued from page* 41)

Shock absorbers are improved by replacing the steel piston skirts with nylon skirts, to reduce scuffing.

The power steering system has been improved by removing the power steering pump and its reservoir from its location at the end of the generator, now driving it from the crankshaft pulley. The control valve assembly has manual adjustment to eliminate unequal proportioning of hydraulic assistance. Revision of valve body grooves causes a more rapid build-up of hydraulic assist with the same manual effort.

A new voltage regulator, with a flatter temperature compensation curve, results in less variation in system voltage with changing temperature and makes the electrical supply more reliable.

Chevrolet continues to supply a large variety of optional accessories, including an improved air conditioning system. One of the new devices added this year is Cruise Control which enables the driver to cruise steadily at a set speed without using the accelerator, primarily for turnpike driving. The thermostatically modulated viscous fan drive is retained as part of the air condition system, except on the Six. ■

Young designs special radiator with built-in oil cooler for Huge New Tractor-Scraper

Clark Equipment Company's Michigan Model 310 Scraper.

MONO-WELD® Radiator by **Young**

Cools both water and oil under toughest operating conditions

Rear view of radiator shows connections for oil cooling.

Cooling giants like this Michigan Model 310 scraper is a job calling for Young radiators. By designing a radiator with a special core section at the bottom equipped with patented turbulators for cooling the lube oil, Young eliminated the need for a separate oil cooler. Special construction features of the Mono-Weld Radiator insure maximum heat transfer and dependable ruggedness to match the superior construction of this equipment.

Young radiators are used where the going is tough

Write Dept. 109-K for catalog No. 148A

Young RADIATOR COMPANY
RACINE, WISCONSIN
Creative HEAT TRANSFER ENGINEERS
Executive Office: Racine, Wisconsin, Plants at Racine, Wisconsin, Mattoon, Illinois

1960 Cadillac

(*Continued from page* 49)

sion lower arm which reduces road noises and vibrations; and a temperature-controlled fan on all air conditioned cars.

A 10 per cent reduction in the coil spring rate and further improvement in the shock absorbers result in better riding qualities.

Compression ratio remains at 10.5 to 1 for all engines and the horsepower is unchanged in the two power plants—a 345 hp engine for the Biarritz, Seville and Brougham and a 325 hp engine for all other models. The 345 hp engine can be had as optional equipment in the other models.

Improvements in this year's engine include a new full flow oil filter with disposable cartridge, and a new flexible oil ring with side sealing for increased oil economy.

Air suspension remains standard on the Eldorado Brougham, Eldorado Biarritz and Eldorado Seville. It is optional on other models.

Accessory refinements for 1960 include the use of vacuum instead of electric power for quieter safety door locks, and a newly styled automatic headlight dimmer that is much smaller and is known as Guide-Matic. ■

AUTOMOTIVE INDUSTRIES . . .
is your News Magazine of Automotive and Aviation
MANUFACTURING

Another new development using

B.F.Goodrich Chemical *raw materials*

These tool handles are molded in various colors by Fawick Flexi-Grip Company, Akron, Ohio. B.F.Goodrich Chemical Company supplies the Hycar nitrile rubber.

Handles of Hycar help tool users come to grips with grease problems

These colorful tool grips are molded especially for use in gas stations, machine shops and maintenance areas. Unlike handles molded with conventional rubber, they won't get soft and sticky in shop use. Hycar nitrile rubber resists oil, gas, chemicals and solvents.

Hycar wears and wears because of its toughness and unusual abrasion resistance. It's no wonder that since they've started equipping tools with handles of Hycar, tool makers are experiencing measurable increases in sales.

Hycar nitrile rubber has wide application wherever gas, oil or chemicals may be a problem—or wherever you need extra abrasion resistance, strength or flexibility. There are many different types of Hycar rubber available—in latex form as well as dry rubber. For more information, write Dept. CK-4, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

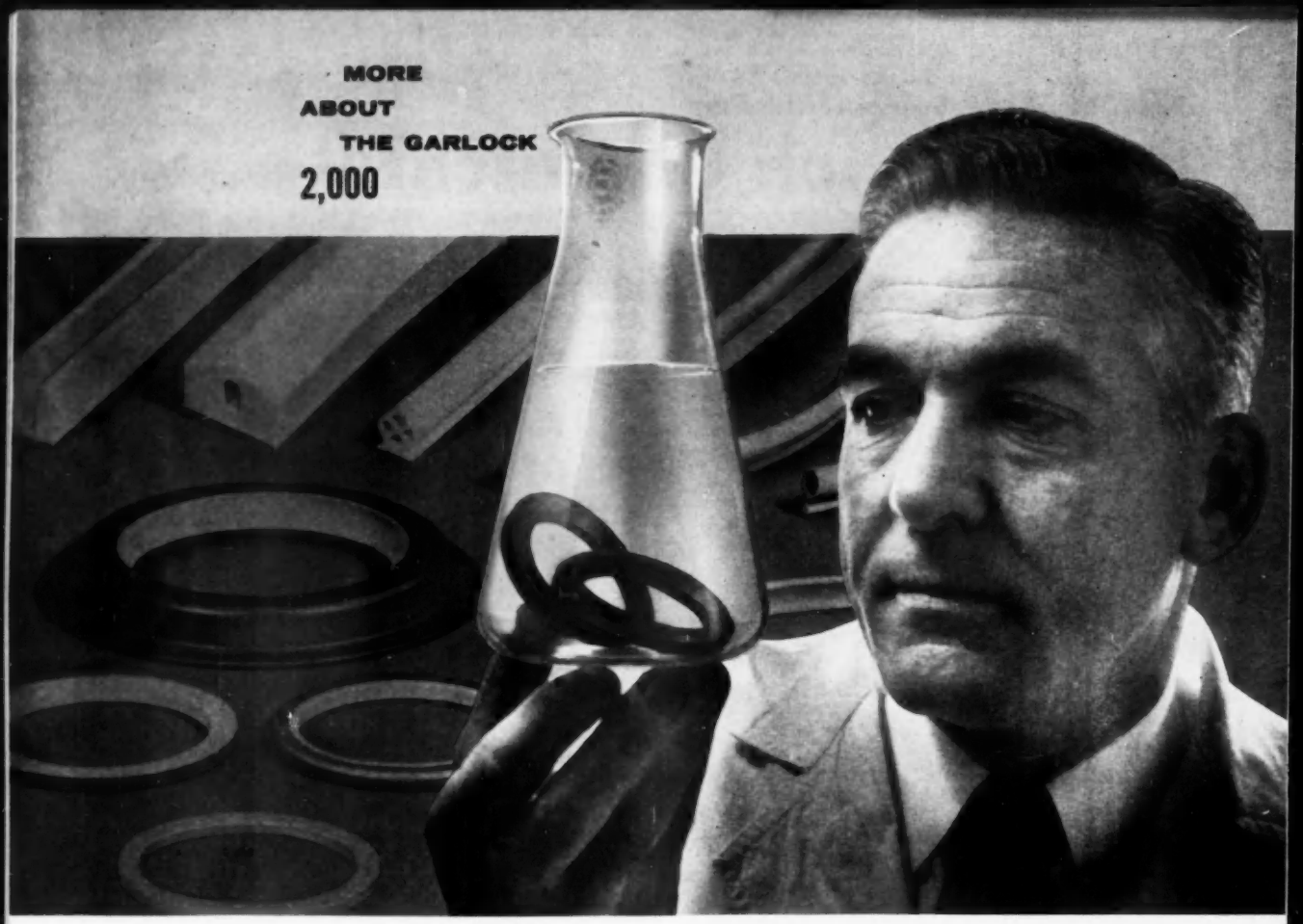
Hycar
REG. U.S. PAT. OFF.
Rubber and Latex

B.F.Goodrich Chemical Company
a division of The B.F.Goodrich Company

B.F.Goodrich

GEON polyvinyl materials • HYCAR rubber and latex
GOOD-RITE chemicals and plasticizers • HARMON colors

Circle 131 on Inquiry Card for more data



Garlock rubber parts are thoroughly tested

When you specify molded, extruded, die-cut, and metal-bonded rubber parts, be sure they are right for the job. Garlock conducts over twenty different tests on rubber materials before, during, and after manufacture. These tests are continuous and exhaustive. First the rubber is compounded with carefully selected materials and mixed exactly to specification. Then it is tested for durometer hardness, tensile strength, elongation . . . resistance to water, weather, temperature . . . many other vital characteristics. For instance, in determining aging, the rubber compound is left at room temperature for extended periods. At the same time, identical rubber compound is exposed to extreme heat in an accelerated aging test and then returned to room temperature, after which the effects of heat are determined. For ultimate elongation, a series of rubber pieces .075" thick are precisely stretched to the breaking point and the increase in length accurately recorded. Scientific measurements like this using ASTM methods, plus quality control throughout manufacture, assure you of the finest molded and extruded rubber parts available. Special attention is given to compounds which must meet military and SAE-ASTM specifications.

Whatever rubber your design calls for—from Silicone for intricate, high and low temperature applications to Viton* for extreme temperature and solvent resistance—Garlock has the answer for you. Make your selection from thoroughly-tested rubber compounds. Parts from these compounds are another of the Garlock 2,000 . . . two thousand different styles of packings, gaskets, and seals for every need. For complete information, contact your Garlock representative, or write

THE GARLOCK PACKING COMPANY, Palmyra, N. Y.

For Prompt Service, contact one of our 26 sales offices and warehouses throughout the U.S. and Canada.

**Du Pont Trade Mark*

GARLOCK

Packings, Gaskets, Oil Seals, Mechanical Seals,
Molded and Extruded Rubber, Plastic Products

Canadian Division: The Garlock Packing Co. of Canada Ltd.

Plastic Division: United States Gasket Company

Circle 132 on Inquiry Card for more data

More horsepower for the new Caterpillar D8 tractor

AIRESEARCH T-1404 TURBOCHARGER

Turbocharger system specifically designed for big Series H tractor

A joint development of Caterpillar and AiResearch, the turbocharger system is an integrated part of the new D8 Series H tractor. Extensive field tests showed an increase of 20% in bulldozing and a substantial gain in pushloading production with the Series H... brought about by the tractor's greater horsepower, faster torque rise, greater weight and faster dozing and reverse speeds.

Specifically designed to match the new tractor's requirements, the new turbocharger underwent thousands of test hours on the new D8 operating in every kind of material on every kind of job.

AiResearch turbocharger advantages include: increased horsepower, improved lugging ability, cooler exhaust temperatures, reduced maintenance costs, less smoking and noise. This is another application of AiResearch turbochargers to heavy industrial machinery.

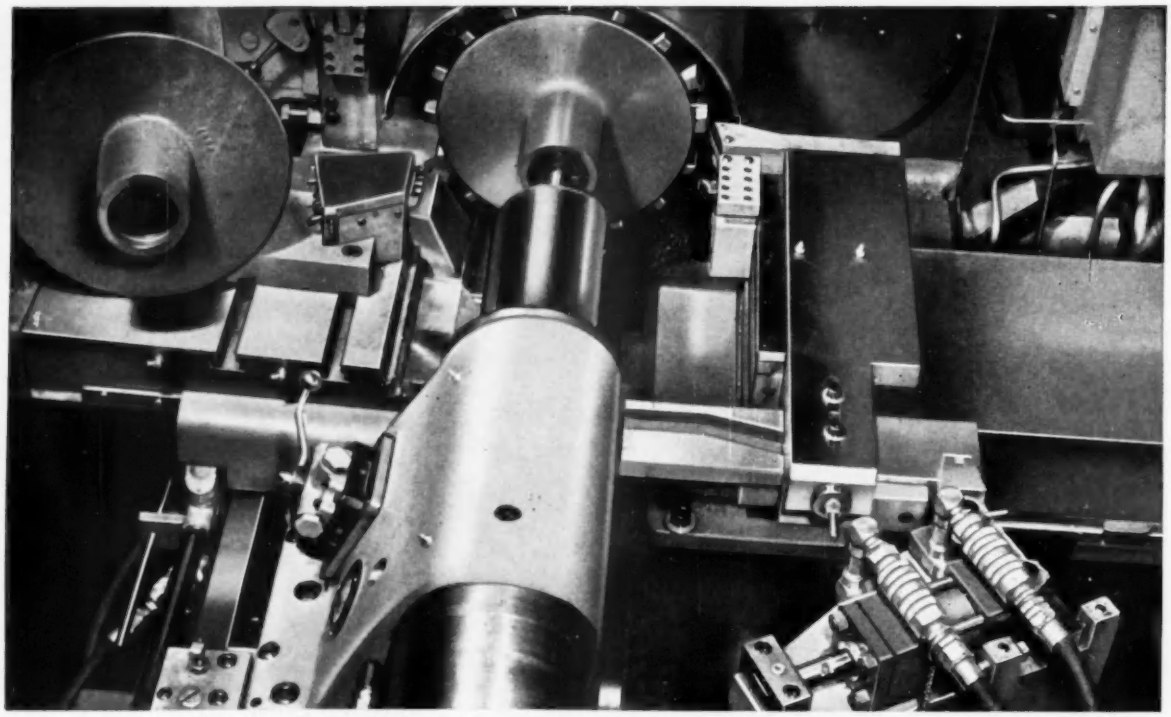
THE GARRETT CORPORATION

AiResearch Industrial Division

9225 South Aviation Blvd., Los Angeles 45, California

DESIGNERS AND MANUFACTURERS OF TURBOCHARGERS AND SPECIALIZED INDUSTRIAL PRODUCTS

Circle 133 on Inquiry Card for more data



Note how 16-jaw chuck grips 10"-diameter, inner pulley disc on narrow portion of O.D. This permits machining entire flange face. Accurate taper is generated by cam-operated sliding toolholder shown at right.

No. 12 replaces two manual lathes, cuts time 53%

Automatic cycle, fast setup cut job-lot costs...free operator for other work.

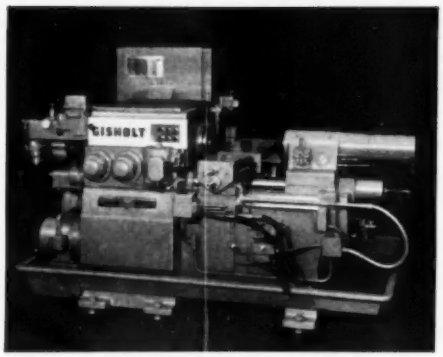
This fast, versatile setup may give you some new ideas on paring job-lot costs. Lewellen Manufacturing Company, Columbus, Indiana, uses it for machining three types of cast iron pulley discs in 15 sizes—in lots ranging from 50 to 100 pieces.

Previously this work required two manually operated lathes. Now one operator does the entire job 53% faster on one Gisholt No. 12 MASTERLINE Automatic Chucking Lathe.

Here's how a typical inner pulley disc, 10" in diameter, is handled: To permit machining beyond the tapered face, the work is held on a narrow portion of the previously turned O.D. in a 16-jaw chuck. A chuck-mounted mandrel with tailstock support provides rigidity for higher speeds and feeds.

Front carriage tools turn the hub O.D. within .0005" and form the base radius. The flange is taper-faced from a cam-controlled sliding toolholder on the rear independent slide. A second tool faces the hub end. Time, just 2.2 minutes, f.t.f.

Change-over for different sizes averages less than 30 minutes. One 30° adjustable cam handles all tapers. Quick-disconnect fittings are easily reversed for tool relief when changing from inner to outer discs.



Gisholt MASTERLINE No. 12 Automatic Chucking Lathe

FOR COMPLETE INFORMATION

on how the No. 12 can cut your costs on job-lots and production runs, contact your Gisholt Representative—or write for new catalog, Form 1213.

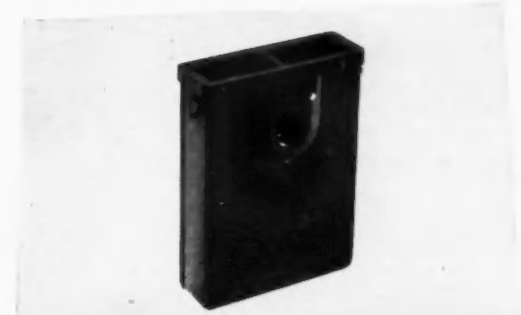
GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

Turret Lathes • Automatic Lathes • Balancers • Superfinishers • Threading Lathes • *Factory-Rebuilt Machines with New-Machine Guarantee.*

Investigate Gisholt's Extended Payment and Leasing Plans

Circle 134 on Inquiry Card for more data

FROM UNBREAKABLE CASES



TO MOTOR MOUNT BASES—

WHENEVER CUSTOM-MADE RUBBER PRODUCTS ARE CALLED FOR, CALL FOR YOUR FIRESTONE TECHNICAL SERVICE MAN

Taking bottlenecks out of production lines is a specialty with your Firestone Technical Service Man. He's adept at handling varied production problems ranging from shatterproof battery cases to motor mount bases. And—at the drop of an invitation—he'll meet *your* individual needs with a custom-tailored plan! He'll analyze your specifications expertly and make precise recommendations. Then he'll put Firestone's complete rubber and latex custom-production service at *your* service.

Firestone's extensive laboratory facilities develop the exact compounds and product designs to fit your requirements. And Firestone's mass-production facilities deliver close-tolerance, high-volume output at reasonable costs.

See how much the Firestone Technical Service Man has to offer you without cost or obligation. Simply send in the coupon—or phone one of our nearby sales offices—today.

Firestone RUBBER & LATEX PRODUCTS COMPANY
FALL RIVER, MASSACHUSETTS

Copyright 1959, The Firestone Tire & Rubber Company

WE'D LIKE TO TALK TO YOUR FIRESTONE TECHNICAL SERVICE MAN WITHOUT COST OR OBLIGATION.

FMR-1(2)

NAME & TITLE

COMPANY

PRODUCT MANUFACTURED

ADDRESS

CITY

ZONE STATE

Announcing **HY-PRO**

Co-form® X-PRESS® TAPS

Manufactured under license from Besly-Welles Corporation

for tapping threads without cutting

Recommended for tapping . . .

Copper Brass Lead
Aluminum Zinc
Steel Magnesium
Die Castings
Leaded Steel
Stainless Steel
— other ductile metals

Tapping operation is the same

Conventional methods and equipment are used, except for change to larger tap drill sizes.

NOW — from HY-PRO you can get the newest in tap design — Co-form X-PRESS fluteless taps that are setting cost-reduction records on many jobs that were formerly "tap-killers".

HY-PRO Co-form X-PRESS taps cold-form threads in through or blind holes, with these advantages . . .

No Chips to clog and cause tap breakage — no chip removal problems • **Permit Faster Tapping Speed** and boost production from automatic equipment **Provide Accurate Control** of hole size — cannot be forced into lead error • **Eliminate Blind Hole Tapping Problems** — no chips to jam at bottom • **Form Stronger Threads** with better holding power • **Taps Are Stronger** without flutes, especially in smaller sizes **Taps Last Longer** and maintain accurate size tolerance **More Holes Per Tap** — up to 40 times greater tap life.

Try HY-PRO Co-form X-PRESS taps on your toughest tapping operations. For complete application information, call your HY-PRO Distributor or write: HY-PRO Tool Company, New Bedford, Mass. Dept-A

Tap for less with Co-form® X-PRESS®

For the complete line of HY-PRO standard taps from stock, call your local HY-PRO Distributor.

®Co-form is a registered trademark of Hy-Pro Tool Company.

®X-PRESS is a registered trademark of Besly-Welles Corporation.

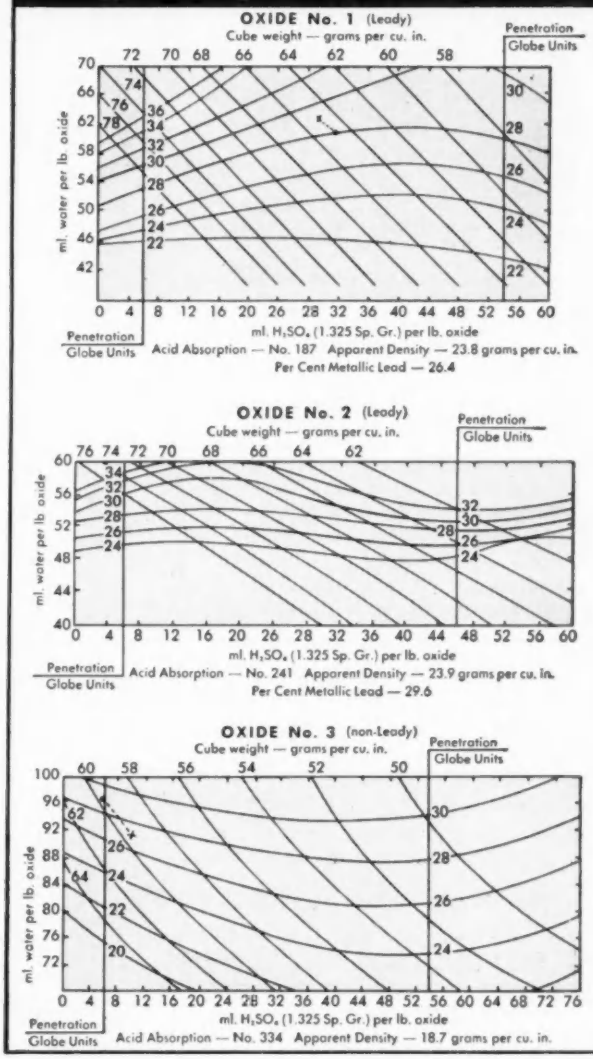
HY-PRO TOOL COMPANY
NEW BEDFORD, MASS., U. S. A.

to GLOBE RESEARCH no battery is ever perfect

from Globe Research

laboratory control of paste mixing at the production point for top battery quality

Typical mixing curves for different oxides


OXIDE No. 1 (Leady)
Cube weight — grams per cu. in.
Penetration
Globe Units
ml. water per lb. oxide
ml. H_2SO_4 (1.325 Sp. Gr.) per lb. oxide
Acid Absorption — No. 187 Apparent Density — 23.8 grams per cu. in.
Per Cent Metallic Lead — 26.4
OXIDE No. 2 (Leady)
Cube weight — grams per cu. in.
Penetration
Globe Units
ml. water per lb. oxide
ml. H_2SO_4 (1.325 Sp. Gr.) per lb. oxide
Acid Absorption — No. 241 Apparent Density — 23.9 grams per cu. in.
Per Cent Metallic Lead — 29.6
OXIDE No. 3 (non-Leady)
Cube weight — grams per cu. in.
Penetration
Globe Units
ml. water per lb. oxide
ml. H_2SO_4 (1.325 Sp. Gr.) per lb. oxide
Acid Absorption — No. 334 Apparent Density — 18.7 grams per cu. in.

In the manufacture of lead-acid storage batteries in a multi-plant operation, the control of the oxide paste mixing is essential. Through laboratory work, specific curves for cube weight and plasticity (penetration) vs. the mixing proportions of acid and water have been developed for each oxide used.

Thus, by controlling the water and acid, plasticity and cube weight can be determined for any oxide used at any of Globe's battery plants.

Globe research continues to develop means for production control. Work in progress relating to pastes and oxides involves the study of particle size, re-activity in sulphuric acid and the rate of reaction in sulphuric acid of various oxide blends. These studies will lead to closer control of conditions to produce pastes with invarient properties.

For more information write for Bulletin, entitled: "Lead-acid battery pastes compositions and characteristics."

For original equipment or replacement, Globe Spinning Power Batteries are readily available from 16 strategically located plants.

SPINNING POWER
GLOBE-UNION
SPLIT-SECOND STARTING

GLOBE-UNION INC.

MILWAUKEE 1, WISCONSIN

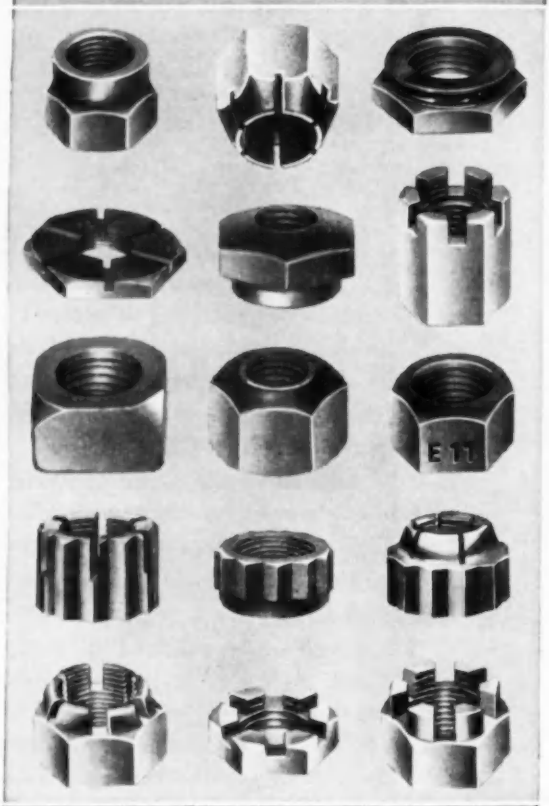
If it's Petroleum-powered there's a GLOBE-BUILT BATTERY right from the start!

Circle 137 on Inquiry Card for more data

SPECIAL NUTS

to specs. 1/16"—4 1/4" cross flats

special machines + large stock of material × years of experience = speedy deliveries high quality low prices



Here are a few samples made to customers specifications . . Our batteries of special high-speed multi-spindle, automatic machines make possible fast and accurate production of hexagon nuts of non-standard height and special shape from carbon or alloy steel, Naval bronze or other non-ferrous metals; also AN 310 through AN 335 as per latest Airforce specifications. Very often the special nut you require may be similar to one we are already making and a simple modification would result in a price advantage and quicker deliveries to you . . Send us your blueprint and particulars —let us quote on your requirements . . We also have a catalog that contains complete specifications, engineering data and prices regarding our standard nuts.

Manufacturer of Standard and Special
12 Pointer, Square and Hexagon Nuts
..."Huglock" and "Conelock" locknuts.

NATIONAL MACHINE PRODUCTS COMPANY

an SPS company 44250 UTICA ROAD UTICA, MICH

Circle 138 on Inquiry Card for more data

TAILOR-MADE PLASTIC TANKS

to do the work of metal without problems of

FABRICATION, WEIGHT OR DETERIORATION

If your business involves gases, chemicals, or liquids, you know the problems resulting from conventional containers.

We can truthfully say that SF seamless reinforced plastic tanks *lick* most of those problems. For example, SF tanks —

won't corrode . . . won't dent or rupture . . . insulate well . . are fire retardent . . . won't conduct electricity . . . can have permanent color and identifying marks "built in"...and can be machined, ground, or threaded for fittings. Four standard sizes can be shipped immediately from stock . . . 6", 8", 10", and 13" diameter.

It will pay you to call or write Structural Fibers *now*. Whether it's tanks or tubs or parts, we'll tell you what is possible and whether it's practical!

structural fibers, inc.

FIFTH AVENUE • CHARDON, OHIO

REINFORCED PLASTIC PRODUCTS BY THREE PROCESSES:
• internal pressure molding
• matched die molding
• premix molding

Circle 139 on Inquiry Card for more data

Another new development from Detrex:

HOT OR COLD Phosphate Coating Processes

Improve Your Quality With Detrex PAINTBOND

Depend on Detrex for every Metal Cleaning and Processing need

- PERM-A-CLOR NA (Trichlorethylene)
- Solvent Degreasers
- Ultrasonic Equipment
- Industrial Washers
- Phosphate Coating Compounds
- PAINTBOND Compounds
- Aluminum Treating Compounds
- Alkali and Emulsion Cleaners
- Rust Proofing Materials
- Extrusion and Drawing Compounds
- Spray Booth Compounds

World's Largest Exclusive Producer of Cleaning Chemicals and Equipment

Now, Detrex offers new PAINTBOND processes tailored to your exact needs. These tested and proved processes include chemicals for applying zinc-iron phosphate and iron phosphate coatings to steel, iron, zinc or cadmium surfaces – whether the application is by spraying or immersion, or the preferred method is hot or cold.

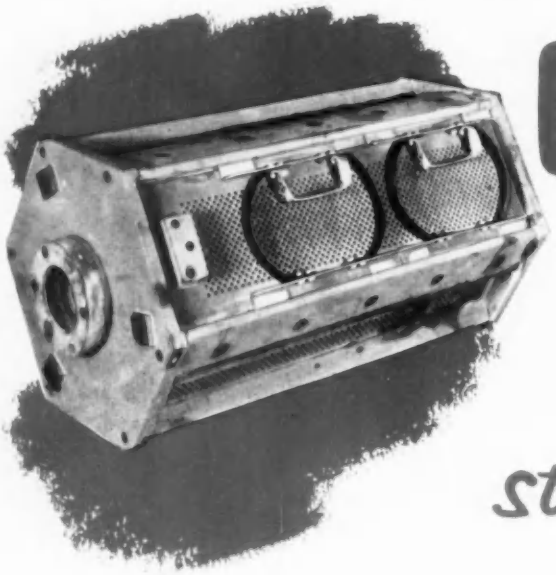
Regardless of your location, Detrex' nation-wide technical service is at your disposal. A trained Detrex service engineer will be glad to review your process and make the proper recommendation to improve quality and reduce the unit cost of your operation. And he will make periodic call-backs to aid you in maintaining maximum quality and efficiency at all times.

DETREX CHEMICAL INDUSTRIES, INC.

Box 501, Dept. AI-1059, Detroit 32, Michigan

Circle 140 on Inquiry Card for more data

3,500,000 pounds of plating



processed by this UDYLITE TEMPRON cylinder . . . and it's *still going strong*

This TEMPRON Cylinder has handled more than three and one half million pounds of work without replacement or repair. This impressive performance was recorded at the Detroit plant of Bellevue Plating, a division of National Machine Products Co. There, 24 of these cylinders continue daily to deliver high economy, low maintenance production for the fifth straight year. They are operated regularly under extreme and abrupt temperature changes stubbornly resisting heat, cold, abrasion and chemical action.

In the experience of users everywhere, these rugged TEMPRON Cylinders, an original Udylite design, prove to be a best-possible buy. You, too, can achieve full production with an absolute minimum of shut-downs for maintenance by installing durable Udylite TEMPRON Cylinders in your plant. If you're not already enjoying the benefits of these perennially economic producers you owe it to yourself to investigate their money-making potential. Ask your Udylite man about TEMPRON cylinders or write . . .

Al Betteley of Bellevue Plating says:

"We are thoroughly satisfied with Udylite TEMPRON Cylinders. The only reason that we haven't bought more of them for our present equipment is that we haven't worn out the original ones. You may be sure that we will specify Udylite TEMPRON cylinders on any new equipment of this type."

the udylite corporation

detroit 11, michigan • world's largest plating supplier

Circle 141 on Inquiry Card for more data

STRENGTH AND UNIFORMITY are outstanding characteristics of the automotive ball-joint bearings shown below. These sintered metal parts demonstrate Moraine Products' capabilities in working with customers to develop the most practical designs. They also demonstrate Moraine Products' responsibilities—making economically, and in quantity, parts that must not fail under the most rugged operating conditions.

Parts shown ½ actual size.

Vital parts for industrial progress

Moraine Products
Division of General Motors, Dayton, Ohio

370 mph prop-jet Hercules combat transport starting on target drone launching mission. It will cruise at 30,000 ft. Special radar and launching gear permit Hercules to fire, monitor and aid recovery of drones in tests of ground and air defense systems. *Photo courtesy Lockheed.*

R/M friction piece prolongs landing

Designers of Lockheed's C-130 Hercules, prop-jet assault transport, required a friction material which would help prolong the life of the landing gear guide track. Its use was to face aluminum shoes attached to four main shock struts.

Rigorous tests

Specifications called for a friction material of relatively high bearing strength to withstand ground load stresses of up to 18,000 psi and stable coefficient of friction within a narrow range required to operate against the aluminum track which it would contact.

A wide variety of metal and organic friction materials were subjected to rigorous tests at temperatures to −65°F, in such contaminants or abrasives as mud, dust, tar and ice. The material proved most satisfactory was R/M sintered bronze brazed onto a .010-in.-thick strip of mild steel, a product of Raybestos-Manhattan ingenuity.

A structural adhesive bonds the material to an aluminum shoe at 70 psi with a curing cycle of 1 hour at 350°F. In inspection tests, the bond must show a peel strength of not less than 50 lb. per inch of width.

The aluminum shoe assemblies, faced with the R/M materials, are mounted on air-oil shock struts which serve to support the aircraft on the ground, absorb landing shocks.

Satisfactory performance

Lockheed engineers report that the R/M material has been used in every production model of the C-130 and has delivered

R/M FIRST IN FRICTION

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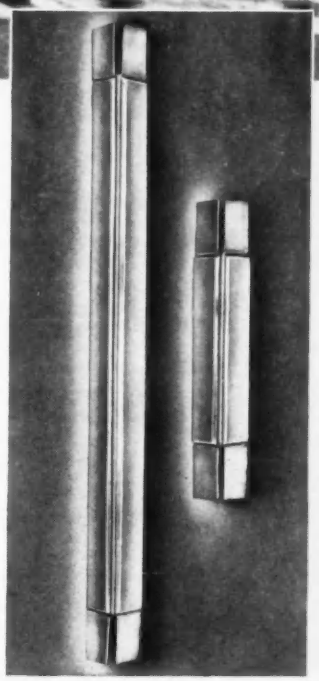
gear life !

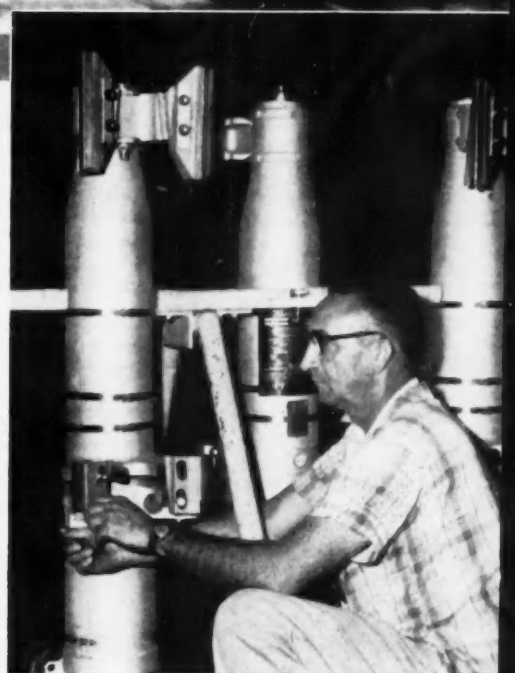
satisfactory performance in this exacting application . . . not one report of excessive wear!

This is another example of the diversity of successful applications of Raybestos-Manhattan friction materials. Why not let R/M's experienced engineers help you solve your friction problems . . . you can always be sure of sound, unbiased counsel on the materials best suited to a given application—for *only R/M manufactures all types of friction materials!* An R/M sales engineer can be at your desk within 24 hours.

Send now for your free copy of Bulletin No. 501 —packed with helpful engineering information on friction materials.



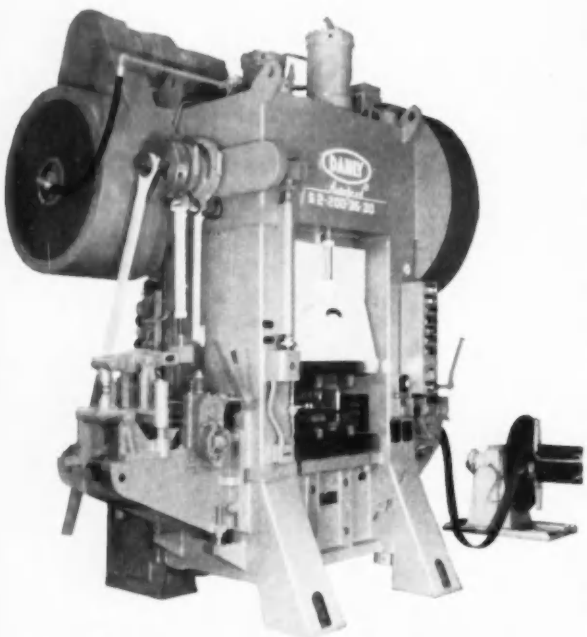
R/M sintered bronze brazed onto .010-in.-thick strips of ½-in.-wide mild steel from these 8¼- and 3-in.-long friction pieces for the Hercules.



Lockheed technician completes installation of landing gear guide shoes onto main shock struts. 16 shoes, each faced with ½-in.-wide sintered metal strip, are used in every production model of the C-130.

DANLY The Leading Supplier to the Stamping Industry

in PRESSES



Look at the Nation's most modern stamping plants . . . see which press you find most frequently . . . you'll discover it's Danly! There are good reasons for this. You get lower operating costs with Danly Presses—you can depend upon it! The extra muscle and precision built into all Danly equipment means smoother die closure, less vibration, less die wear. Danly Presses reduce profit-eating maintenance and spare parts inventories . . . produce more accurate stampings, and more parts per shift.

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In every instance, Danly can meet your most exacting diemaking specifications with a die set—standard or special. Since pioneering the first mass-produced precision die sets 36 years ago, Danly has continuously developed new production, inspection and distribution methods to serve you better.

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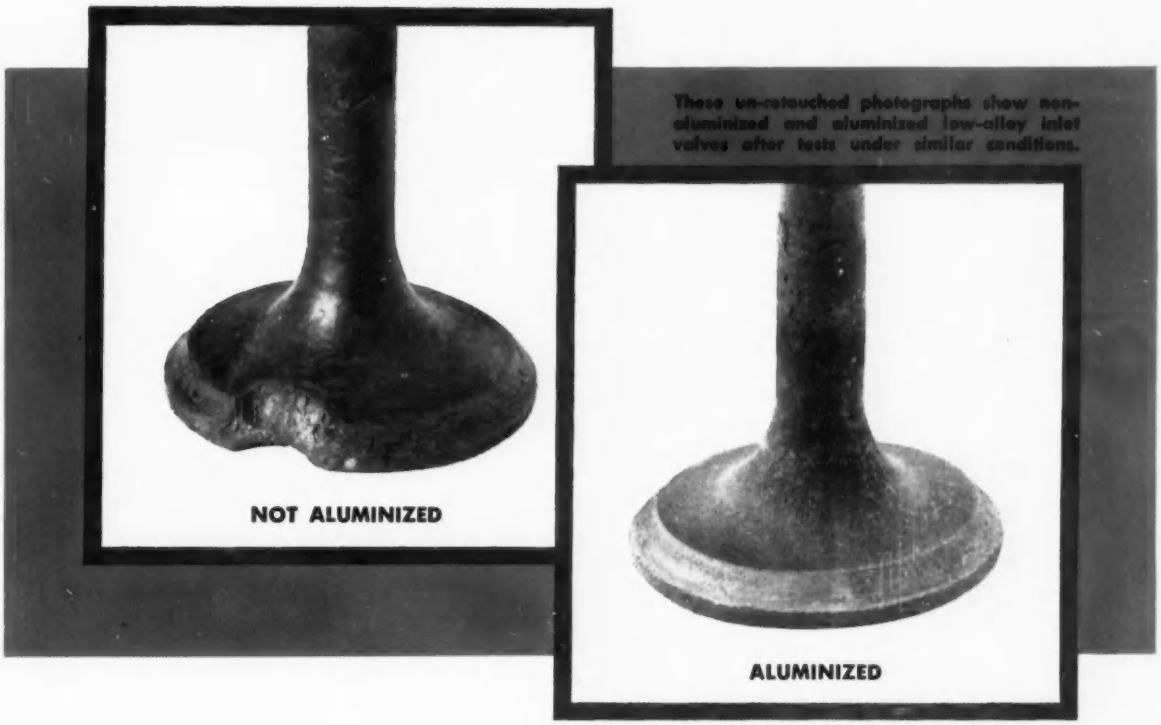
These un-retouched photographs show non-aluminized and aluminized low-alloy inlet valves after tests under similar conditions.
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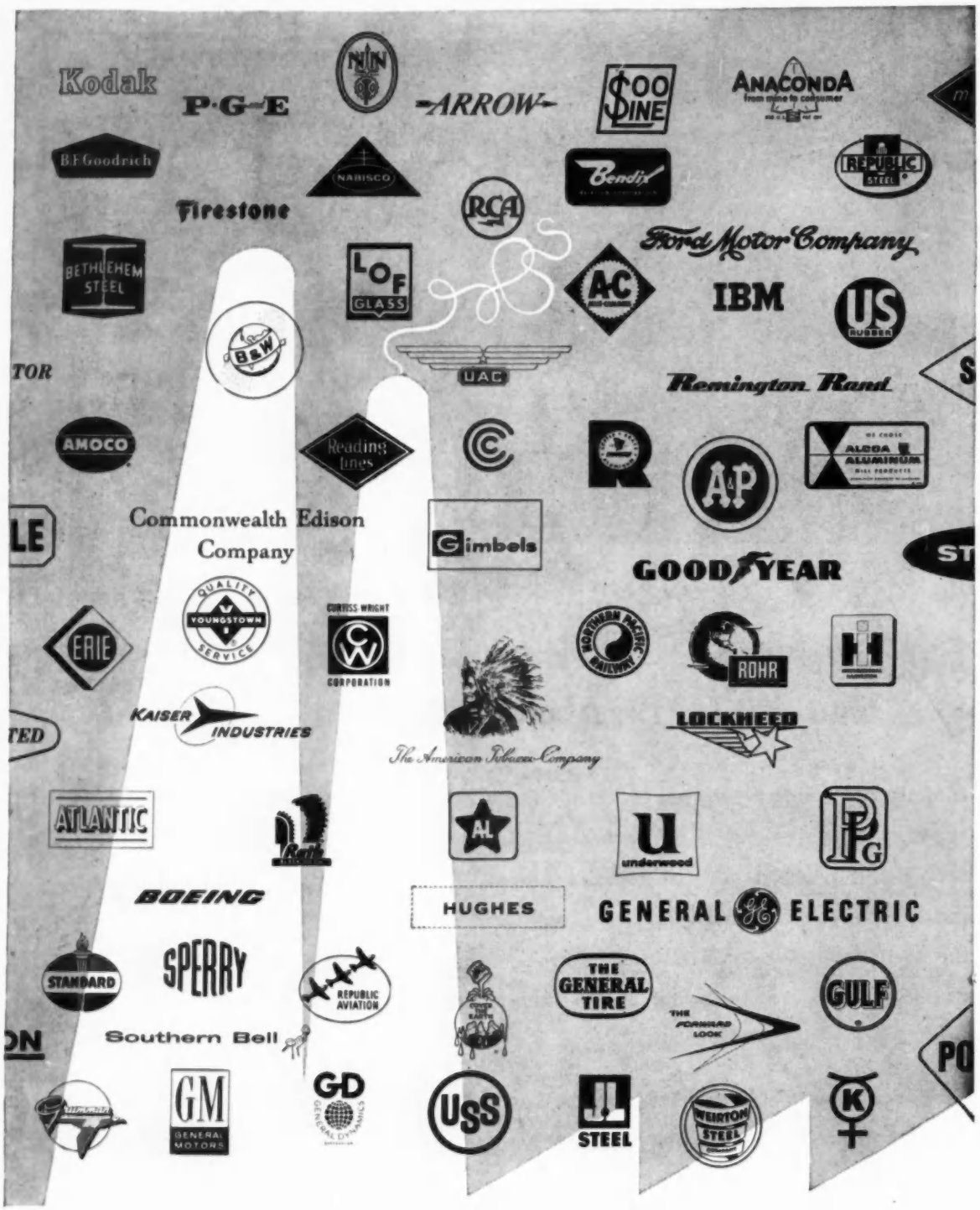

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in fastener engineering

One of the earliest and most basic breakthroughs in fastener design was the common clothes pin. And, although DOT is not a manufacturer of clothes pins, many a DOT industrial fastener has had an equally revolutionary effect on modern fastening technique. Hundreds of different DOT fasteners have created relatively minor revolutions in specific industries.

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Rather than spend your own design staff's time on fastening problems, it might pay you well to call in DOT. You'll have at your service a design and production organization with large-scale facilities for genuine mass-production of special-purpose fasteners and self-fastening devices of all kinds.

Supplementing the Carr Fastener Company are a number of other plants which form the United-Carr Fastener group. They are located in the principal production centers of the United States, Canada, England and Australia. Your nearest United-Carr field office (see below) is no further away than a telephone call from your desk.

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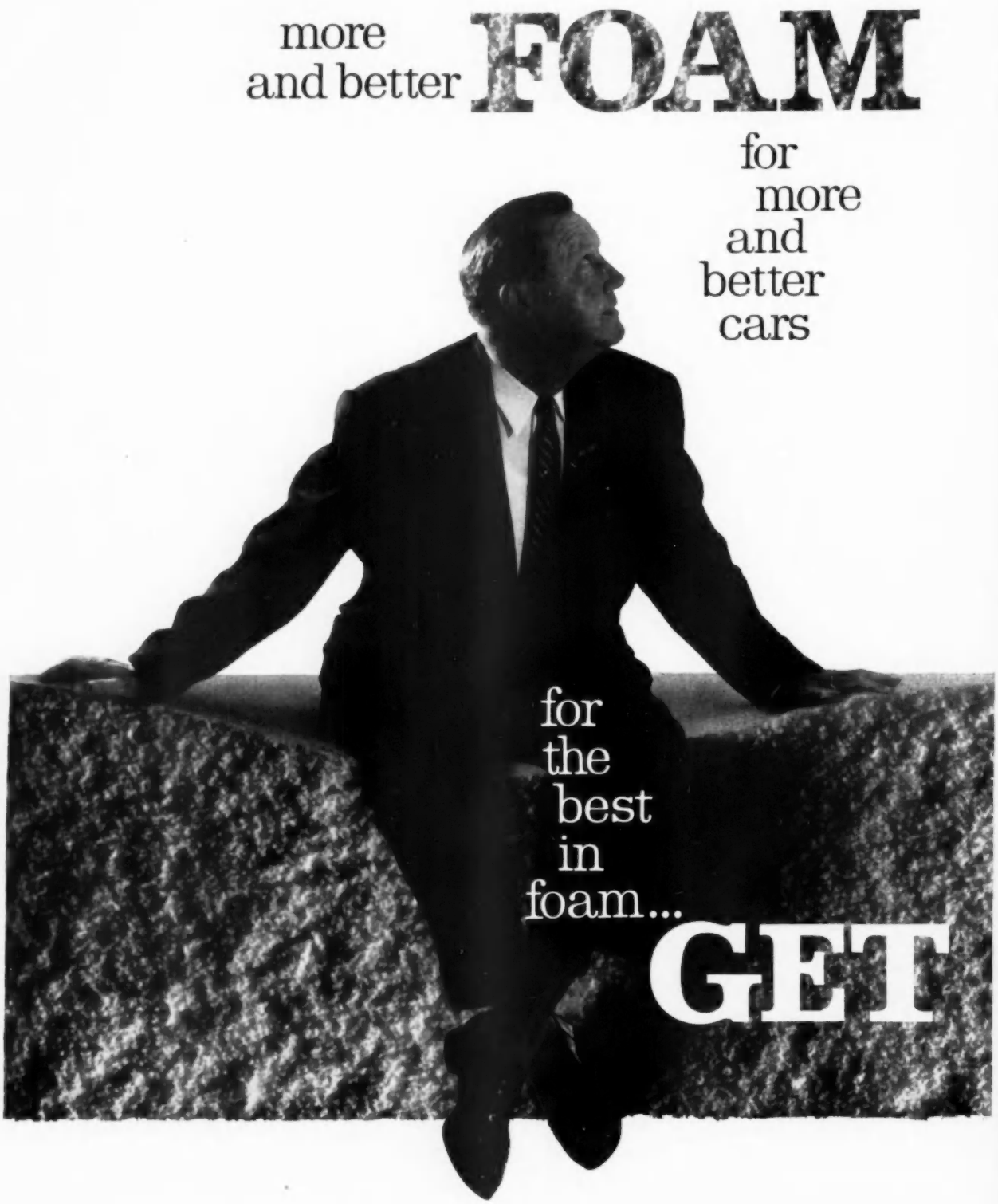
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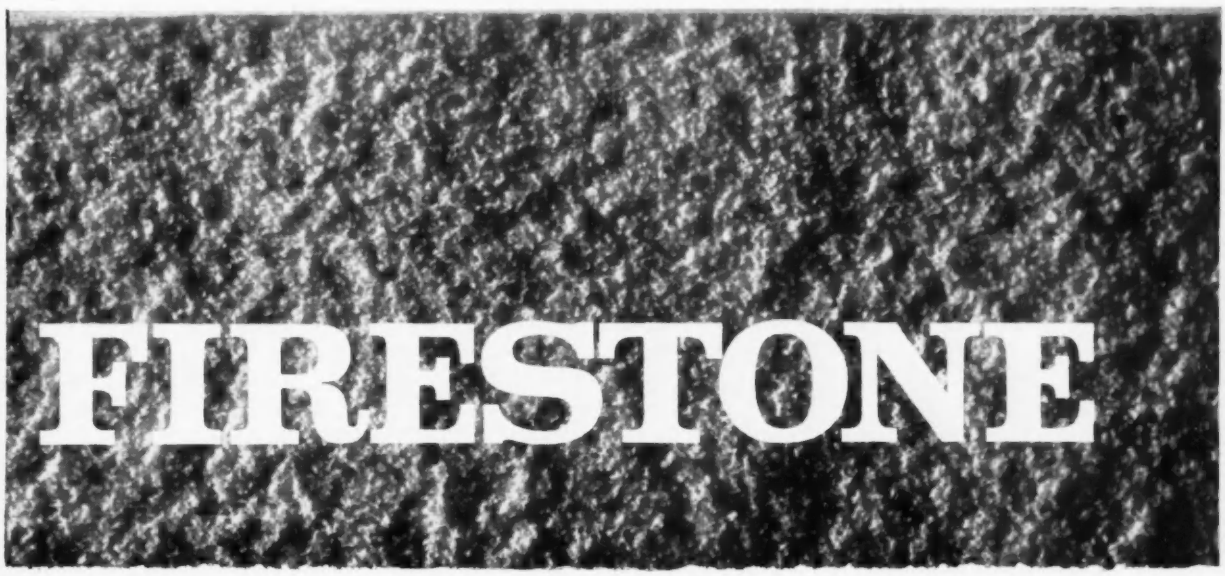

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covering the issues from January 1 to June 15, 1959, inclusive

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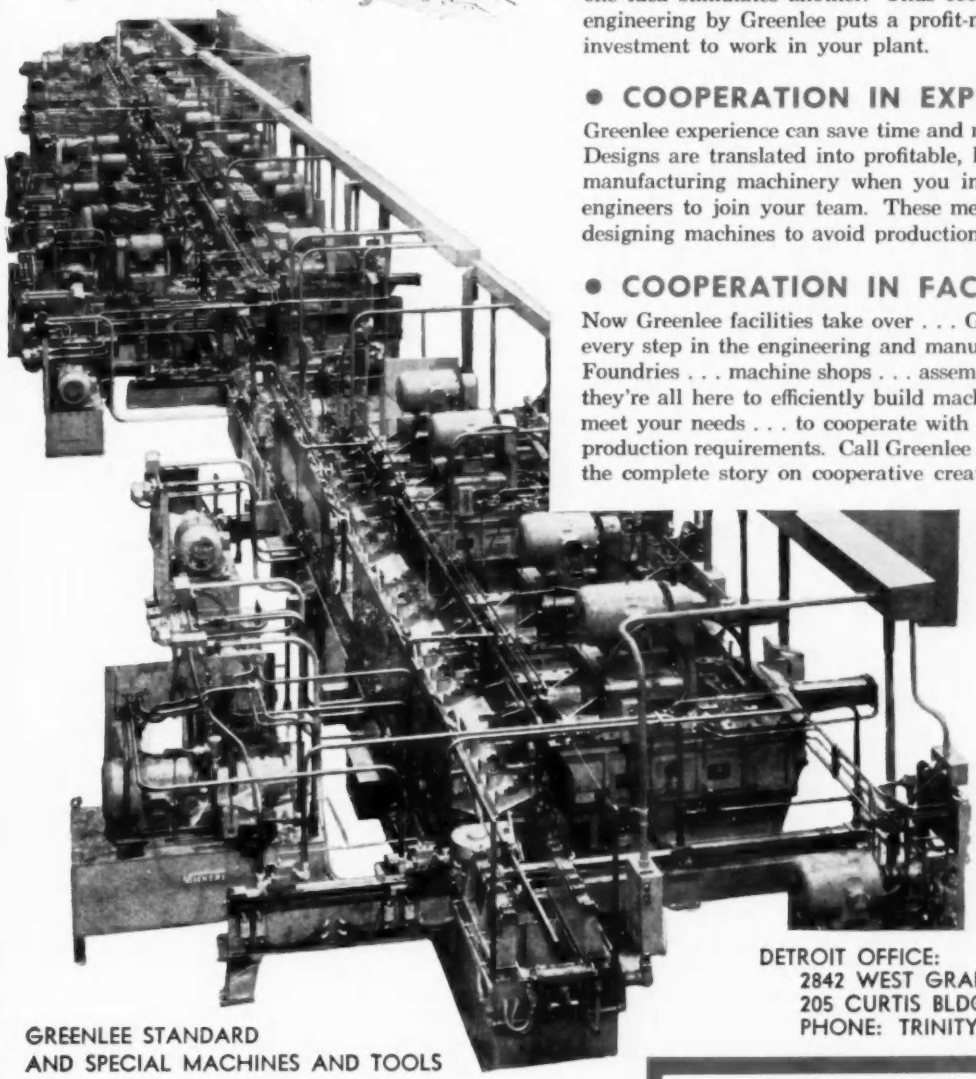

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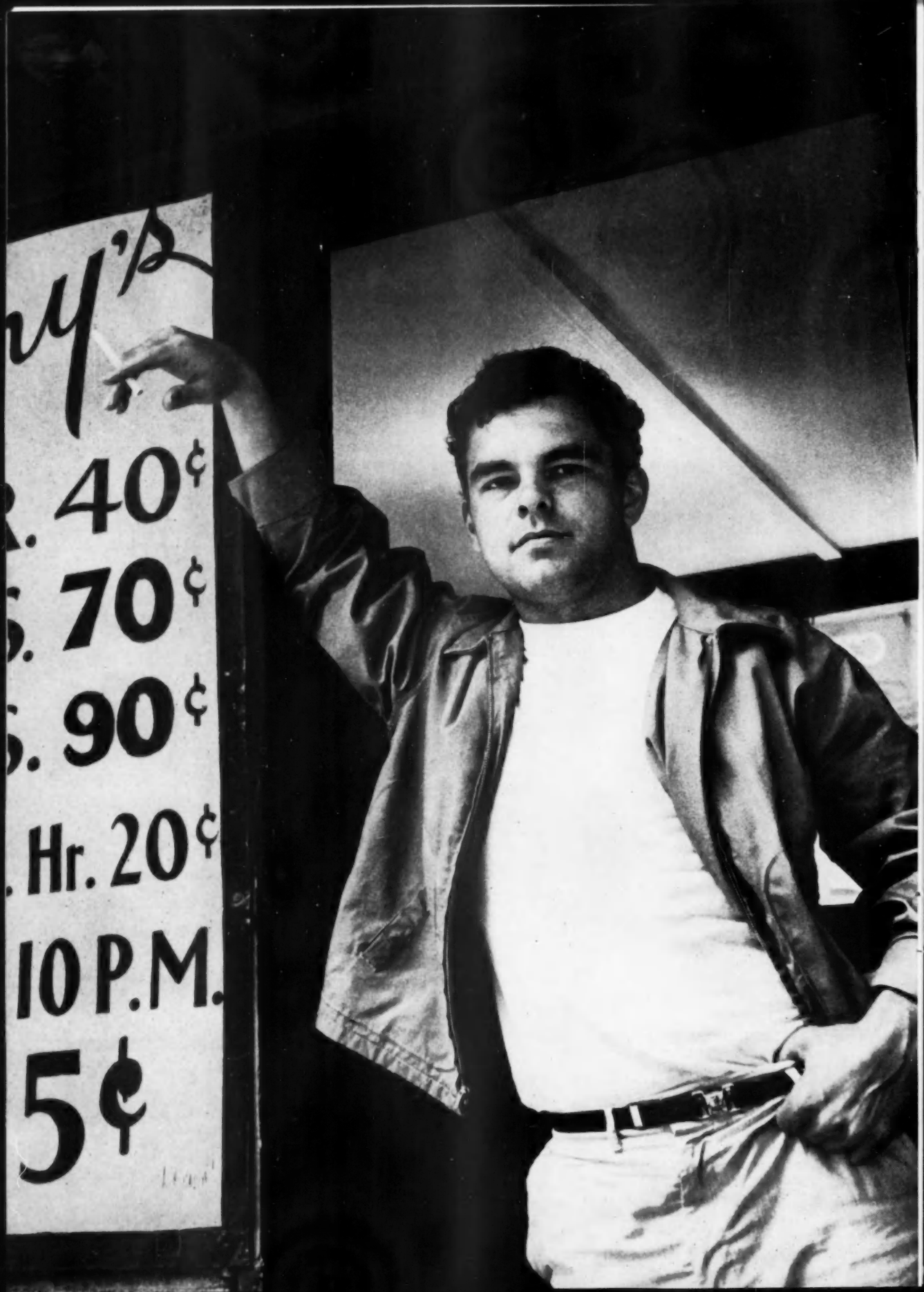
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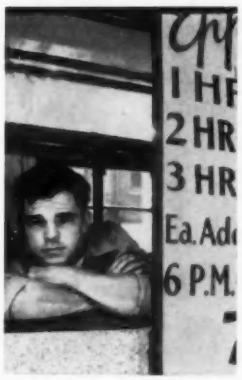

"Stainless Steel is the best thing that ever happened to auto trim . . . and the parking lot industry,"

says Jackie Roller, Parking Attendant, Eppy's, Pittsburgh, Pa.

Q. Mr. Roller, do you feel qualified to comment on Stainless Steel auto trim?

A. Well, I've been knocking around in this business for eight years now and I pretty well know all the wrinkles.

Q. And what do you think about Stainless Steel?

A. Stainless Steel is the best thing that ever happened to auto trim.

Q. How would you compare it to other trim materials?

A. It's stronger.

Q. You mean Stainless Steel trim isn't a decoration that's going along for the ride . . . it adds to the structural strength of the car because Stainless is so strong?

A. . . . yes.

Q. And what about the much greater hardness of Stainless Steel?

A. *Much* harder.

Q. Doesn't the extreme hardness of Stainless Steel trim make it more resistant to dents and scratches that would mar other trim materials?

A. Yes. It's the best thing that ever happened to us parking attendants. You should hear how . . .

Q. What about the overall appearance of Stainless Steel trim?

A. Very nice.

Q. We mean, doesn't the hardness and corrosion resistance of Stainless Steel keep it bright and clean for years?

A. Yes.

Q. Doesn't Stainless Steel have a deep, jewelry-like luster that far outclasses any other trim material?

A. Yes . . . far.

Q. Don't you feel that the luster of Stainless Steel bespeaks taste instead of gaudiness?

A. Yes.

Q. Now, do you feel that even though Stainless is a little more expensive than other trim materials, it will often actually save money for car manufacturers?

A. Yes . . . Well, no, I never felt that.

Q. Well, don't you feel that because of its greater strength and hardness, manufacturers don't have to overdesign with Stainless Steel? Won't a little bit of Stainless Steel look better, work harder, and cost less than a lot of weaker metals? And because Stainless is easy to fabricate, won't it save money in production—for example, replace more expensive die castings with Stainless Steel stampings?

A. Yes.

Q. Would you say that these advantages —strength, hardness, appearance, formability, and economy—are reasons why manufacturers use more and more Stainless Steel trim every year . . . and why dealers and buyers are glad they use more?

A. Yes.

Q. Thank you, Mr. Roller.

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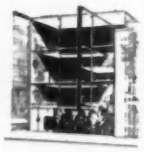
A CHILTON  PUBLICATION

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FREE LITERATURE

Mist Coolant System 1

A pressurized mist coolant system that delivers coolant mixture under pressure to banks of machinery or a large number of stations is covered in a new descriptive bulletin. As many as 30 nozzles, to a height of 15 ft or parallel distance of 100 ft, can be serviced from a single dispenser. *Trico Fuse Mfg. Co.*

Generating Set 2

The entire line of Diesel engine-driven electric generating sets, recently announced by *D. W. Onan & Sons Inc.*, is described and illustrated in a two-color folder.

Armature Assembly 3

Brochure P-68, four pages, offers information on an armature drive for heavy duty applications. Included are sections on operation, dimensions, replacement parts, and installation. *Wagner Brake & Clutch Co.*

Panel Meters 4

Indicating panel meters and pyrometers in numerous sensitivities, styles and sizes, for monitoring any electrically measurable variable, are described in 12 page Bulletin 107. *Assembly Products, Inc.*

Ultrasonic Cleaning 5

A 12 page ultrasonic cleaning primer for use as a guide by potential users of ultrasonic cleaning equipment is available from *National Ultrasonic Corp.*

Load Control 6

Bulletin GET-2916, four pages, discusses theory and application of tie-line load, frequency load, reactive power, and power limiting control in industrial plants, and describes strip-chart recorders and control equipment available. *General Electric Co.*

Roll Lathe 7

A six page bulletin describes and illustrates the new line of Farrel-Betts roll lathes which can be arranged for either hydraulic or electric contouring. They can also be furnished for plain turning with a wide range of feeds. *Farrel-Birmingham Co., Inc., Consolidated Machine Tool Div.*

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FREE LITERATURE—*Continued*

Titanium Handbook 8

A comprehensive 36 page handbook outlining corrosion resistant properties of titanium metal and its design and fabrication characteristics has been published by the *Titanium Metals Corp. of America.*

Floor Trucks 9

A 56 page catalog of industrial and institutional floor trucks has been announced by the *Hamilton Caster & Mfg. Co.* Presented is the maker's line of four-wheel platform trucks, box trucks, shelf trucks, wagon trucks, two-wheel trucks, dollies and trucks for special uses.

Fuel Pumps 10

A series of fixed displacement, balanced vane type fuel pumps for jet engines is described in four page Bulletin A 5242. The brochure features the design and performance characteristics which enable these pumps to meet military specifications for contamination tolerance and service life. *Vickers, Inc.*

Abrasive Wheels 11

Over 1600 abrasive wheel recommendations for grinding everything from Agate to Zirconium are set up in alphabetical order in a new 57 page catalog. *The Carborundum Co.*

Construction Services 12

A 16 page brochure describes a complete installation through start-up service for automation and instrumentation systems. Services include a contact organization furnishing installation drawings and installation of the panels, field instruments, field interconnections, commissioning, operator orientation and providing supplementary instrumentation personnel when needed. *Panellit Service Corp.*

Mechanical Drives 13

Bulletin 3600, six pages, on the Allispede mechanical adjustable speed drive has been published. The drive operates on a-c power, offers speed ranges up to 8 to 1, and is available in ratings from 1 to 30 hp. *The Louis Allis Co.*

Collets 14

Catalog 23, 24 pages, illustrates and describes Sutton collets and feeders for use on automatic screw machines, turret lathes, engine lathes, milling machines, and grinders. *Sutton Tool Co.*

Tool Holders 15

Gahr Machine Co. has released a catalog sheet on its line of adjustable flanged tool holders for use on turret lathes and hand screw machines.

Adjustable-Speed Drives 16

A 12 page booklet gives detailed performance and application data on the complete line of Reliance all-electric, adjustable-speed V*S Jr. drives. *Reliance Electric and Engineering Co.*

Screw Machines 17

"Carbide and the Automatic Screw Machine" is the title of a new booklet which presents some fundamental data on the use of carbide tools on steel with Brown & Sharpe automatic screw machines. *Brown & Sharpe Mfg. Co.*

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Cushion Couplings 18

An expanded line of Dodge Para-Flex flexible cushion couplings ranging from fractional to 190 hp per 100 rpm is described in 12 page Bulletin A663C. *Dodge Mfg. Corp.*

Processing Ovens 19

Bulletin 159, six pages, covers a complete line of industrial heat processing ovens. Both batch and semi-automatic continuous types are illustrated. They are built in four general temperature ranges: 650, 800, 1200, and 1500 F maximum. *Hevi-Duty Electric Co.*

Plastic Resin 20

A technical bulletin describing the properties of reinforced plastic resin systems as ablation materials for re-entry into the earth's atmosphere has been published by *Zenith Plastics Co.*

Diesel Models 21

A full-color, illustrated specification folder is available on the 921D and 922D—Diamond T's conventional Diesel truck models. A choice of four engines is available in the new trucks. *Diamond T Motor Truck Co.*

Cold Heading Wire 22

Extruded cold heading wire, its advantages, applications, stock tempers, characteristics, and specifications, is discussed in a four page bulletin. *Scovill Mfg. Co.*

Insert Brochure 23

A four page brochure describes the S110 insert developed by *Hi-Shear Rivet Tool Co.* It states how hole preparation cost is reduced, explains simplicity of insert installation, variety of tooling, and removal. Test results for push-out, torque-out, and tensile strength are graphed.

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Mill Shapes 24

Bulletin BR-12 covers Polypenco ploycarbonate mill shapes. It contains descriptions and suggested applications for polycarbonate rod, plate, disks and tubing, which are machinable on standard metalworking equipment. *The Polymer Corp. of Penna.*

LP Gas 25

Advantages of liquefied petroleum gas as a fork truck fuel are discussed in a six page brochure. A comparison is made between the operating characteristics of LP gas and gasoline. *Industrial Truck Div., Clark Equipment Co.*

Pneumatic Tools 26

"Series 2" pneumatic tools, with large, powerful, rotary vane motors are fully detailed in Bulletin 102, now being released by *Doeden Tool Corp.*

Seam Welders 27

An all-new trim-line of seam welders is covered in Bulletin S-59. The illustrated brochure gives complete description and specifications covering the three available stock sizes ranging in capacity from 50 to 400 kva. *The Federal Machine & Welder Co.*

Manganese Bronze 28

An extruded manganese-bronze alloy for high production jobs is described in a data sheet prepared by *Ampco Metal, Inc.*

Belt Conveyors 29

A fully illustrated bulletin published by the *E. W. Buschman Co.* describes that firm's newly developed line of "L" series belt conveyors.

Carmet Catalog 30

A revised 32 page bulletin called, "Carmet Catalog C-16-B" is available from Carmet, the carbide producing facility of *Allegheny Ludlum Steel Corp.* The catalog contains a number of changes over material previously distributed.

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There are 35 variations in the Elektrojet line, covering the requirements of unusual or "impossible" machining operations on a wide variety of parts ranging from small missile components to forging dies. Folder M-2077, containing complete information, will be sent on request. **Milling Machine Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.**

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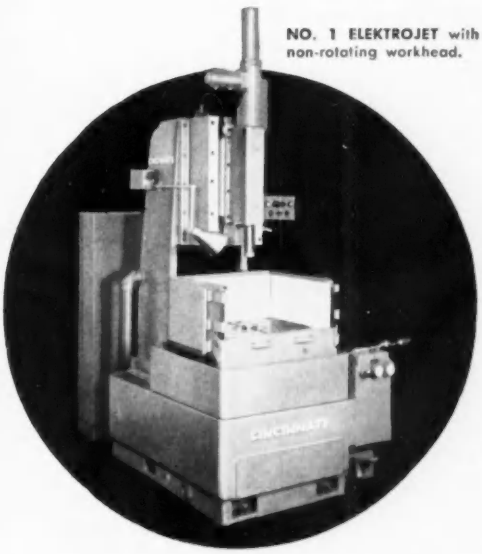

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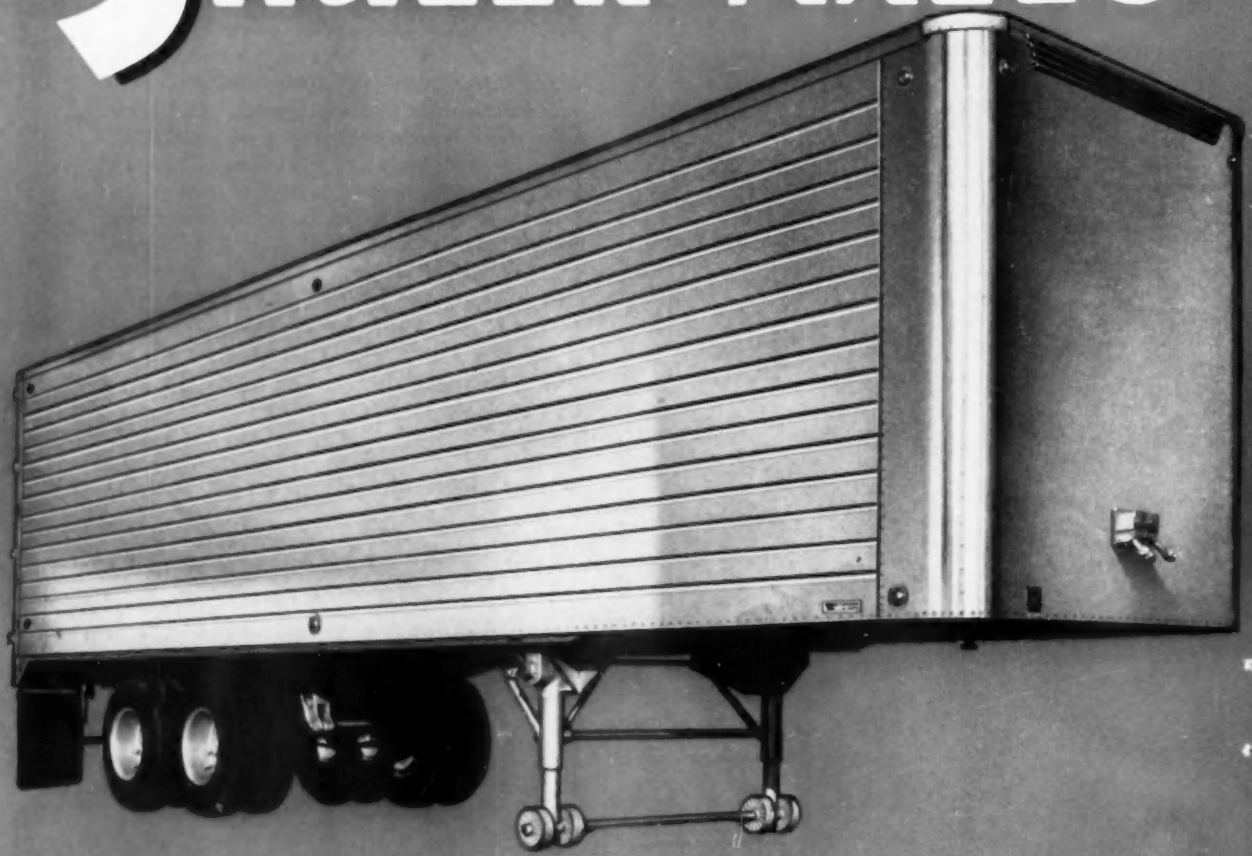

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